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CHINA'S GEOGRAPHIC FOUNDATIONS

A Survey of the Land and Its People

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CHINA'S GEOGRAPHIC FOUNDATIONS

A Survey of the Land and Its People

BY

GEORGE BABCOCK CRESSEY

PH. D. (CHICAGO), PH. D. (CLARK)

*Chairman, Department of Geology and Geography
Syracuse University*

FIRST EDITION
TENTH IMPRESSION

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“Spring passed and summer passed into harvest and in the hot autumn sun before winter comes Wang Lung sat where his father had sat against the wall. And he thought no more about anything now except his food and his drink and his land. But of his land he thought no more what harvest it would bring or what seed would be planted or of anything except the land itself, and he stooped sometimes and gathered some of the earth up in his hand and he sat thus and held it in his hand, and it seemed full of life between his fingers. And he was content, holding it thus, and he thought of it fitfully and of his good coffin that was there; and the kind earth waited without haste until he came to it.”—PEARL S. BUCK in “*The Good Earth*.”

PREFACE

China is passing through social, economic, and political readjustments without parallel in all history. A great nation which has been characterized by isolation and tradition is rapidly readjusting its life and becoming a member of the family of nations. Geography cannot pretend to solve the many problems which these changes present, but it can indicate something of the environment in which the drama is being enacted. Where people live so close to nature as in China, an appreciation of geography is fundamental in understanding human affairs.

Despite the extensive literature listed in the Bibliography, so little is actually known about population, agriculture, resources, and regional potentialities that it will be many years before an adequate treatment will be possible. Critical geographic field studies of small areas are almost lacking. An adequate presentation of the Chinese landscape should involve an analysis of environmental factors, a study of cultural patterns and their distribution, and an appreciation of historical succession. Since these essential local studies are not available, many partially supported generalizations have been necessary, but every effort has been made to utilize all available information.

This book has evolved during a decade of travel and research. Field work was commenced in 1923 when the author entered China by way of the Gobi Desert to assume a position as geologist on the faculty of the University of Shanghai. During the next six years the writer traveled 30,000 miles, seeing some part of the twenty-eight provinces except Yunnan, Szechwan, Sikang, Sinkiang, and Fukien; and all of the fifteen geographic regions but the Red Basin and the Southwestern Tableland. Numerous vicissitudes have accompanied this work. Bandit encounters and civil warfare have several times complicated field studies. Interior travel has also brought difficulties.

Following three preliminary mimeographed editions, which appeared in Shanghai from 1926 to 1928, work on the present manuscript was commenced in 1928. The book was originally to have been published by The Commercial Press of Shanghai under the title of "The Geography of China." Numerous delays held up presswork, but the book was about to appear when the plant of the Press was destroyed by the Japanese invasion of Shanghai early in 1932. This resulted in

P R E F A C E

the loss of all maps and photographs. The present volume has been reorganized and completely rewritten.

"China's Geographic Foundations" is a contribution toward an understanding of China, both by the Occident and by the Chinese themselves. If it fails to register the author's sincere friendship for the Middle Kingdom, it is because of his desire to portray both the best and the average, and to stress the importance of the environmental restrictions which envelop Chinese life.

Literally thousands have made some contribution to this book. To do justice to the many sources of specific information is quite impossible. Almost every reference listed in the Bibliography finds some echo in these pages. I am especially indebted to publishers and authors who have permitted the use of copyrighted material, as well as to those who have supplied photographs.

Many ideas have been the outgrowth of discussions at the University of Shanghai. Of the many students there who assisted with maps or tabulations special mention should be made of Messrs. Hou Yuh-hwa, Tu Chang-wang, Feng Shao-tang, and Ma Ren-chwen. No little appreciation must also be given to farmers, scholars, and travel companions whose names but not whose aid is forgotten. The Geological Survey of China and especially Dr. Wong Wen-hao have been of real assistance. Other authorities whose names must be mentioned are Father E. Gherzi, Dr. Chu Co-ching, and Mr. Boris P. Torgasheff. None have contributed so much to my understanding of agriculture and regional situations as Dr. J. Lossing Buck of the University of Nanking and Mr. Paul O. Nyhus, formerly United States Agricultural Commissioner in China. The large physiographic diagram and several of the page maps have been drawn by Mr. Vincent Throop of Syracuse University.

My indebtedness to the University of Shanghai and to the American Baptist Foreign Mission Society under whose appointment I served is very genuine. To the Institute of Pacific Relations and the Social Science Research Council must be given very large credit for the appearance of this volume. A generous grant-in-aid by the Council in 1929 on the recommendation of the China Council of the Institute was followed in 1932 by a second grant-in-aid from the Social Science Research Council. The completion of certain illustrations has been made possible by an appropriation from the American Council of the Institute of Pacific Relations and publication is subsidized by the International Research Fund of the Institute in Honolulu. Neither the Council nor the Institute is in any way responsible for any ideas here presented.

The last note of appreciation must be reserved for Marion Chatfield Cressey who has devoted long hours to helpful criticism of text and organization. At countless points her advice has determined the selection of material or its presentation.

GEORGE B. CRESSEY.

SYRACUSE UNIVERSITY,
November, 1933.

THE END-PAPER ILLUSTRATIONS

The illustrations printed on the end papers are reproductions of wood cuts in the "Keng chih tu shih," a book on rice and silk culture by Lou Shou of the Sung dynasty, and edited by the Emperor Kang Hsi in 1696, supplied through the courtesy of the Harvard Yenching Institute. The front end-paper shows the sowing of the rice in the seed beds and is accompanied by the following lines of poetry.

The land is prepared, the grain has sprouted.
Entering the field with each a basket on his arm,
We walk backwards and by a wave of the hand deftly
disperse the seed.
Ere a few days have lapsed the tender blades will be
bending before the wind.
Thus, by a picul of seed may a full harvest be reaped.

The back end-paper depicts the stacking of the grain preparatory to threshing.

See the stacks how they raise on high.
There, then, are our winter supplies.
Our minds are at rest,
For we have plenty to eat.
And our labor is easy from this time forth.

COMMON CHINESE WORDS

Chinese character	Romanization	English meaning	Chinese character	Romanization	English meaning
東	tung	east	一	e	one
南	nan	south	二	erh	two
西	si, hsi	west	三	san	three
北	pei, peh	north	四	sze, ssu	four
山	shan	mountain	五	wu	five
嶺	ling	range, pass	黃	hwang	yellow
海	hai	sea	紅	hung	red
湖	hu	lake	黑	hei	black
江	kiang	river	白	pai	white
河	ho	river	州	chow	(obsolete city endings)
大	ta	large, great	府	fu	
中	chung	central, middle	縣	hsien	county
天	tien	heaven	上	shang	up
地	ti	earth	下	hsia, shia	down
口	kou	mouth			

CHINA

(Central Flowery Republican Country)

中	Chung	Central
華	Hwa	Flowerly
民	Min	Republican
國	Kuo	Country

THE TWENTY-EIGHT PROVINCES

Chinese characters	English name	Pronunciation	Chinese characters	English name	Pronunciation
安徽	Anhwei	on whay	吉林	Kirin	gee lin
察哈爾	Chahar	chah har	吉廣	Kwangsi	gwong see
浙江	Chekiang	jer jee-ong	廣東	Kwangtung	gwong doong
青海	Chinghai	ching hai	貴州	Kweichow	gwei joe
福建	Fukien	foo jee-en	遼寧	Liaoning	lee-ao ning
黑龍江	Heilung-kiang	hay loong jee-ong	寧夏	Ningsia	ning hsia
河南	Honan	hoe nan	山西	Shansi	shan see
河北	Hopei	hoe bay	東山	Shantung	shan doong
湖南	Hunan	hu nan	陝西	Shensi	shen see
湖北	Hupei	hu bay	康	Sikang	see kang
熱河	Jehol	ruh huh	新疆	Sinkiang	hsin gee-ong
甘肅	Kansu	gan soo	新綏遠	Suiyuan	sway yuan
江西	Kiangsi	jee-ong see	四川	Szechwan	sze chwan
江蘇	Kiangsu	jee-ong su	雲南	Yunnan	yoon nan

CONVERSION TABLES

6 mow	=	1 acre	15 mow	=	1 hectare
640 acres	=	1 square mile	100 hectares	=	1 square kilometer
3,840 mow	=	1 square mile	1,483 mow	=	1 square kilometer
1 acre	=	0.405 hectare	1 hectare	=	2.47 acres
1 square mile	=	2.59 square kilometers	1 square	=	0.386 square mile
1 pound	=	0.454 kilogram	1 kilogram	=	2.20 pounds
1 catty	=	1.33 pounds	1 catty	=	.59 kilogram
1 picul	=	100 catties	1 picul	=	59 kilograms
1° Fahrenheit	=	5/9° centigrade	1° centigrade	=	9/5° Fahrenheit
1 inch	=	25.4 millimeters	1 millimeter	=	0.039 inch
1 foot	=	0.305 meter	1 meter	=	3.28 feet
1 mile	=	1.61 kilometers	1 kilometer	=	0.621 mile
1 mile	=	3 li	1 kilometer	=	2 li

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CHINA'S GEOGRAPHIC FOUNDATIONS

A Survey of the Land and Its People

CHAPTER I

THE GEOGRAPHICAL LANDSCAPE

THE HUMAN HERITAGE

The roots of the Chinese go deep into the earth. The carefully tilled gardens, the hand-plucked harvest, and the earthen homes all tell the story of man's intimate association with nature. On every hand a substantial peasantry industriously labors to wrest a meager livelihood from the tiny fields. Innumerable groups of farm buildings, half hidden in clumps of bamboo or willow, suggest the intensity of man's occupation of the soil, and the ever-present grave mounds serve as reminders of the heritage of this venerable land.

The most significant element in the Chinese landscape is thus not the soil or vegetation or the climate, but the people. Everywhere there are human beings. In this old, old land, one can scarcely find a spot unmodified by man and his activities. While life has been profoundly influenced by the environment, it is equally true that man has reshaped and modified nature and given it a human stamp. The Chinese landscape is a biophysical unity, knit together as intimately as a tree and the soil from which it grows. So deeply is man rooted in the earth that there is but one all-inclusive unity—not man and nature as separate phenomena but a single organic whole. The cheerful peasants at work in the fields are as much a part of nature as the very hills themselves. So, too, the carefully tended rice fields are an inescapable element in the human panorama.

No mere photographic portrayal of China can reveal all the varied ties which bind man and the soil together. Crisscross through the visible scene run innumerable threads of relationship. The landscape is a mosaic of many diverse elements, some dependent upon the vagaries of a none-too-certain rainfall, some conditioned by the limita-

tions of the soil, still others molded by the force of tradition. All of these are linked together into a synthetic, animated picture. It is the task of geography to describe and understand these relationships, to draw information from widely scattered sources, and to give it a new significance as applied to the understanding of specific areas. This living panorama forms the cultural landscape.¹

No one can fully understand China without seeing it in time as well as in space. The varied aspects of the cultural landscape have passed through an extensive process of evolutionary adjustment.

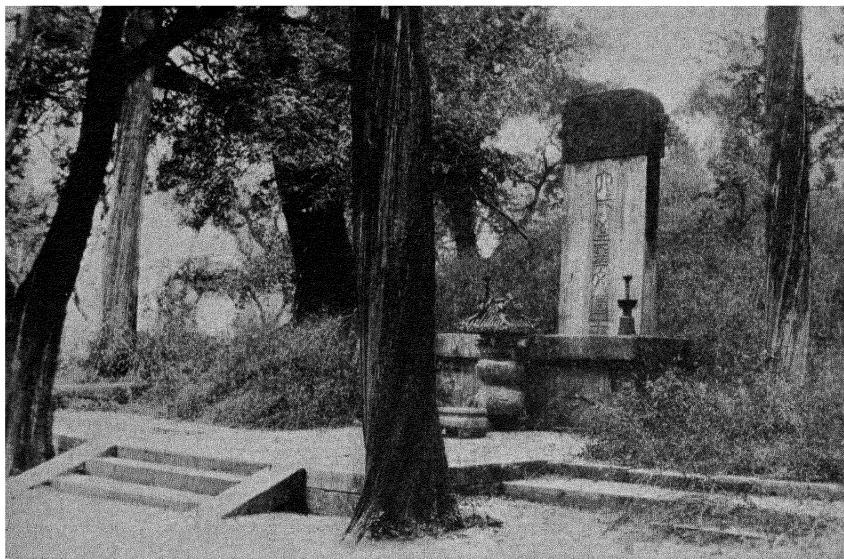


FIG. 1.—No one has contributed more to the social and moral life of China than Confucius. This is his tomb at Chufu in Shantung. (*The Photo Bureau.*)

Almost everywhere man has long ago utilized the resources of nature up to the limit of the tools at his command. Centuries of famine and invasion have pushed people back into practically every corner which will support life. Generations of empirical adjustment have shown the way to secure both the maximum harvest and the most satisfactory social relationships. So complete has become this intimate adjust-

¹ "To every student of the relationship between human activity and natural environment the cultural landscape forms the core and heart of his subject, the central point to which he in the first instance directs his attention, since the cultural landscape states concretely the problem he has to investigate, is indisputably a fact and not a theory, and definitely challenges explanation."—P. W. BRYAN, "Man's Adaptation of Nature," New York: Holt (1933), vi.

ment of cultural pattern to the physical surroundings that we may describe China in the terms of ecological botany as representing something like a climax formation. Here we have an old stabilized civilization which utilizes the resources of nature to the limit. Until new external forces stimulate change, there is but little internal readjustment.

China moves on. What we see today is merely one scene from a long moving picture which we can appreciate only by understanding what has gone before. The Chinese landscape is vast in time as well as in area, and the present is the product of long ages. More human beings have probably lived on the plains of China than on any similar area on Earth. Literally trillions of men and women have made their contribution to the contour of hill and valley and to the pattern of the fields. The very dust is alive with their heritage.

The origin of the Chinese people and their culture is obscure. It is sometimes suggested that they developed somewhere in Central Asia, but there are not even legends of a nomadic or preagricultural life, and it is possible that the Chinese have evolved as a people within the same territory which they now occupy. The discovery of the Peking man *Sinanthropus pekinensis* near Peiping in 1928 gives China claim to being inhabited at least as early as any spot on Earth.

Thus far only fragmentary archaeological evidence of stone-age cultures has been discovered. The communities of this stage seem to have been largely self-sustaining and to have been handicapped by the absence of suitable materials for the manufacture of tools. South-eastern Asia appears to have been deficient in animals and plants susceptible of domestication, so that cultural development was restricted. The significance of this situation has been pointed out by C. W. Bishop of the Smithsonian Institution.¹

"Wherever the aboriginal inhabitants of China have achieved any marked progress in historical times it has been without exception through culture borrowing. The groups that live today in various isolated districts have signally failed to advance themselves through their own efforts. The truth seems to be that the Late Stone Age peoples of the southeast of Asia, including the proto-Chinese, had developed a culture pattern too rigid and inelastic to permit of progress beyond a certain point. This pattern had adjusted itself closely to its environment; but in so doing it had hardened into a routine from which escape was possible only

¹ BISHOP, C. W., The Rise of Civilization in China with Reference to Its Geographical Aspects, *Geographical Review*, XXII (1932), 617-631.

through the aid of external stimuli. Such a cultural phenomenon has occurred time after time in the world's history. It is being repeated today in China itself on an unprecedented scale."

The classical account of China's history opens with the legendary Hsia dynasty some twenty centuries B.C. when bronze was first

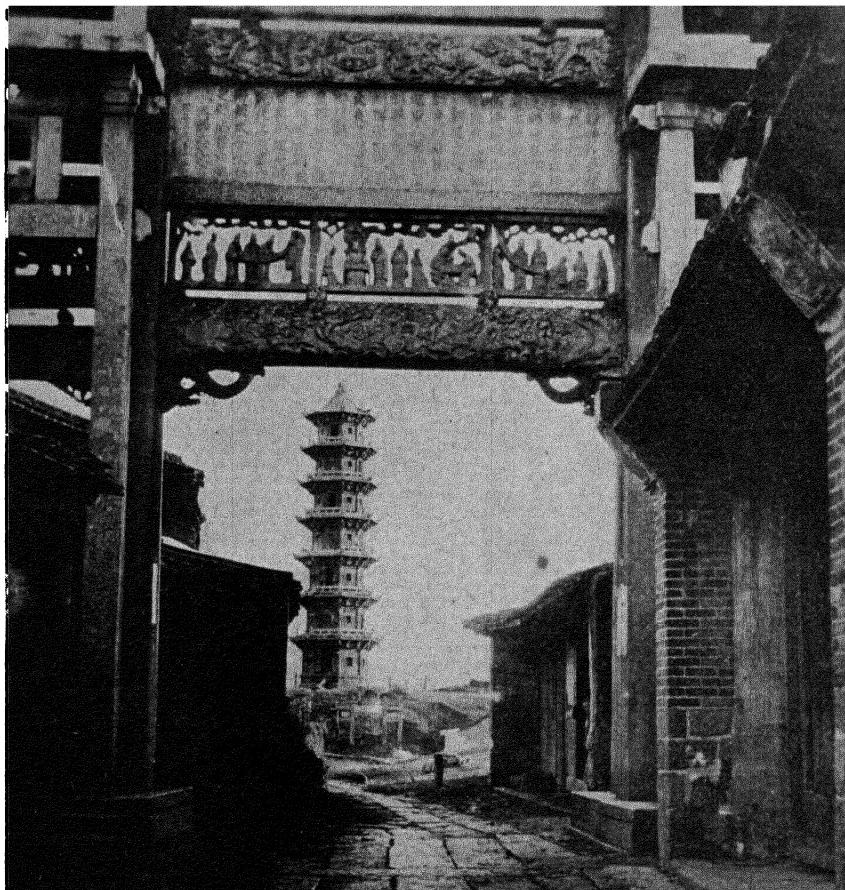


FIG. 2.—The Futsing Pagoda in Fukien, seen through a memorial archway. Such architectural monuments are reminders of China's historic heritage. (*The Photo Bureau.*)

introduced from the west. Following it came the semihistorical Shang dynasty about 1500 B.C. and the Chou dynasty around 1050 B.C. The record of the first two dynasties is now seriously questioned by critical Chinese scholarship,¹ and it seems possible that the earliest

¹ HUMMEL, ARTHUR W., What Chinese Historians Are Doing in Their Own History, *American Historical Review*, XXXIV (1929), 715-724.

authenticated records are those of the Oracle Bones of Honan in 1200 B.C.

Until the rule of Chin Shih Hwang-ti in 220 B.C., China consisted of a group of feudal states in the North, and not until the Han dynasty, 206 B.C., was there any nation-wide government. Since then, political China has been ever changing in area. During the thirty odd centuries of China's known history there has been a cultural rather than a governmental continuity, the product of unifying geographic factors rather than political genius.

Out of this passage of time has arisen a view of life which is deeply implanted in all classes of society. Close human contacts have made respect for personality inescapable. No abstract principle is worth more than friendship, so that, no matter how true a thing may be, it should never be stated unkindly. Along with these social adjustments are those between man and his surroundings. This is well illustrated by an old proverb which reads, "Do your part, be satisfied with your lot, follow the seasons, and trust in Heaven." Perhaps the finest summary of Chinese philosophy is the desire to be "in tune with nature."¹

THE NATURAL ISOLATION OF CHINA

During much of her history, China has been out of touch with the rest of the world.² On all sides there are barriers which handicap intercourse and not only have kept her from knowing much of other countries but equally have prevented Europe from learning of China. Occasional Chinese pilgrims reached India and western Asia, and various adventurers from Europe saw glimpses of the Far East, but there was little exchange of goods or knowledge. Tropical jungles, great mountains, broad deserts, and the widest of the oceans have united to preserve the unity and isolation of China. Small wonder that China became self-centered and that the very name of the country in Chinese means the middle, or central, kingdom!

For several thousand miles China is bounded by the ocean. The Pacific is no longer a barrier, but before the days of modern shipping the ocean was an empty and foreboding expanse, more avoided than the

¹ PORTER, LUCIUS C., Yenching University.

² ". . . it is now generally admitted that the most important element in cultural progress is the contact of many cultures, while nothing breeds stagnation like isolation. Hence an environment which invites contact and provides easy access to and from other districts will promote psychic plasticity and cultural advancement, while one which produces isolation must of necessity lead to psychic stagnation and repetition."—FRANKLIN THOMAS, "The Environmental Basis of Society," New York: Century (1925), 7.

desert. The Chinese seem to have been essentially a continental rather than a maritime folk and rarely launched out upon the high seas as did the Norsemen or the English. No invasion either of arms or of culture ever came to China from across the seas. A few Arab sailing vessels reached the southern ports and there was some contact with Japan, but it was largely a one-way intercourse in which the Japanese took the culture of the continent while giving but little in return. The ocean long proved an effective barrier to the land-minded Chinese, and it was Europe which discovered China, and not China which learned of Europe through her own adventurers.

In the southwest, China touches the peninsula of Indo-China, but the border lies amid steaming tropical jungles reeking with malaria, sparsely populated and still partially unexplored. Little trade or cultural intercourse has ever crossed these barriers. Although China has a common boundary with India for hundreds of miles, the mighty ice-clad mountains and tremendous gorges which separate China and India are among the most formidable obstacles to travel in the world. The few contacts which these neighboring countries established were made by way of the round-about route through Sinkiang and the high passes of the western Himalayas. The lofty plateau of Tibet forms a well-nigh insuperable obstacle.

The most vulnerable side of ancient China lay in the north where the boundary passes through the wide Gobi Desert. The wandering tribesmen of the Asiatic steppes have given China more trouble than all of her other neighbors put together. Repeatedly these desert nomads have invaded North China and seized control of the government, often for centuries at a time. More than two thousand years ago the Emperor Chin Shih united the various barricades or walls of his day to form a continuous rampart from the sea to the margins of Tibet. Since his time the Great Wall has been extended or rebuilt on several occasions, so that what we see today is not everywhere the original structure. This barrier represents China's heroic effort to perfect her almost complete natural isolation.

Within this sheltered pocket of Southeastern Asia, with all of its advantages of soil and climate, it is appropriate that a distinctive culture should have arisen. Unlike the West, China did not develop city states with their urge for commerce and exploration. Her people tilled the soil and were content to carry on with what was at hand. China is not without her explorers, but their reports of distant lands brought no such reaction as did those of the early Europeans who visited the Far East. Despite these handicaps, inventions such as the manufacture of paper, and probably printing as well, spread westward

to Europe. Even in early times porcelains and silks moved through Central Asia to Constantinople and beyond. This trade was handled by a series of intermediary merchants and so involved no direct contact between the Chinese and Europeans. To most of the Chinese their land was the center of all civilization and the few foreigners who came to trade or pay tribute were naturally looked down upon as members of inferior barbarian states.

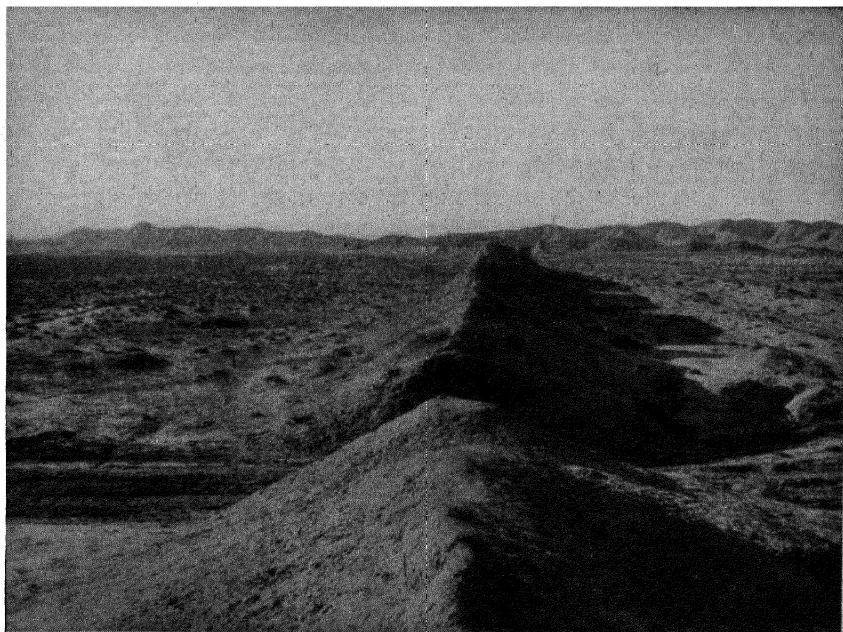


FIG. 3.—The Great Wall represents China's heroic efforts to complete her isolation. This scene, a thousand miles west of Peiping, shows merely an earthen barrier and suggests a reason for the ineffectiveness of the Wall in preventing Tartar invasions.

One of the most significant geographic facts in China's modern history is her new relation to the ocean. Formerly China faced to the north and west, and the Pacific was the back door. The Jade Gate, not far from the end of the Great Wall in Kansu, was the front entrance, and the contacts between Inner Asia and the northwestern provinces played a dominant rôle in the history of the country. Today all this has changed. China has turned about face and now fronts on the Pacific. Shanghai, Canton, and Tientsin have replaced Sianfu and Peiping. The ocean is now a great highway over which have come trade and knowledge. Ships of every flag call at China's ports, and trade is expanding with marked rapidity. Even more important than

the *things* which China imports and exports are the *ideas* which have come across the ocean. China's contacts no longer are limited to her continental neighbors but reach out to the four corners of the world. The bewildering social and economic revolution which is rushing China onward is largely due to her new world-wide contacts which have come across the seas. Shanghai today is the main entrance to China and the Jade Gate is but a poetic memory. This change in geographic accessibility is transforming China. The whole outlook of the nation has been reversed and the traditional isolation is rapidly breaking down. No few decades in the twentieth century, however, can erase the culture built up through thousands of years. Profound changes have occurred in certain port cities and in interior centers made accessible by railroads or navigable waterways, but these changes have scarcely affected the routine life of millions of people in interior provinces.

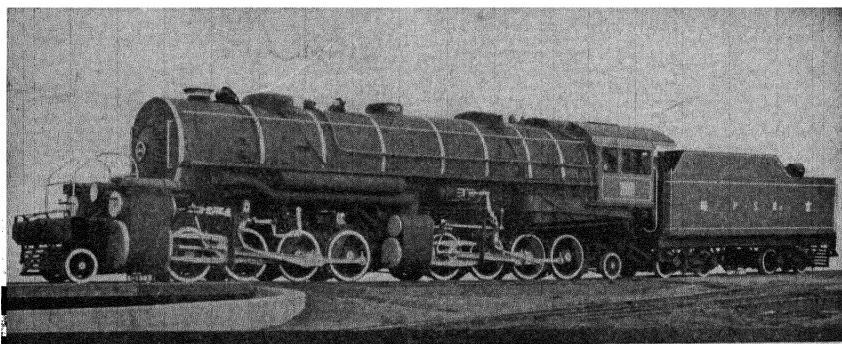


FIG. 4.—The most powerful locomotives in Asia are needed to haul the trains of the Peiping-Suiyuan Railway over the Nankow Pass. (*American Locomotive Company*.)

CHINA, LAND OF CONTRASTS

Within the territory of China exist contrasts as great as may be found in any land on Earth. Glacier-clad mountains, parched deserts, broad prairies, and subtropical forests have helped to create a diversified setting for the Chinese drama. No single panorama can include all the many elements, climatic or human, which play their part. North China is semiarid and raises millet, kaoliang, and wheat, while in the humid South people live on rice. Everywhere, however, there is a characteristic intensity of land use and a nearness to nature. Houses may be made of pounded earth or of split bamboo, hills may be of bare loess or covered with rich verdure, travel may be in lumbering two-wheeled carts or by canal boats, but everywhere there are industrious people.

Side by side are simple agricultural communities and cosmopolitan urban centers. The great department stores of Shanghai carry the latest Parisian fashions and novelties from the marts of the world. Mighty 220-ton locomotives with sixteen driving wheels pull trains over the Nankow Pass west of Peiping. Air mail links the chief commercial centers with an ever-expanding service. Chinese philosophers and statesmen increasingly take their place among the world's leaders. But the contrasts between the new and the old are sharp. One need not travel scores or hundreds of miles to pass from areas of progress into unchanged areas of old ideas. The transition from the twentieth century to the Ming dynasty is often merely a matter of a few steps. Within sight of each other one may see huge modern factories and simple farmhouses thatched with straw.

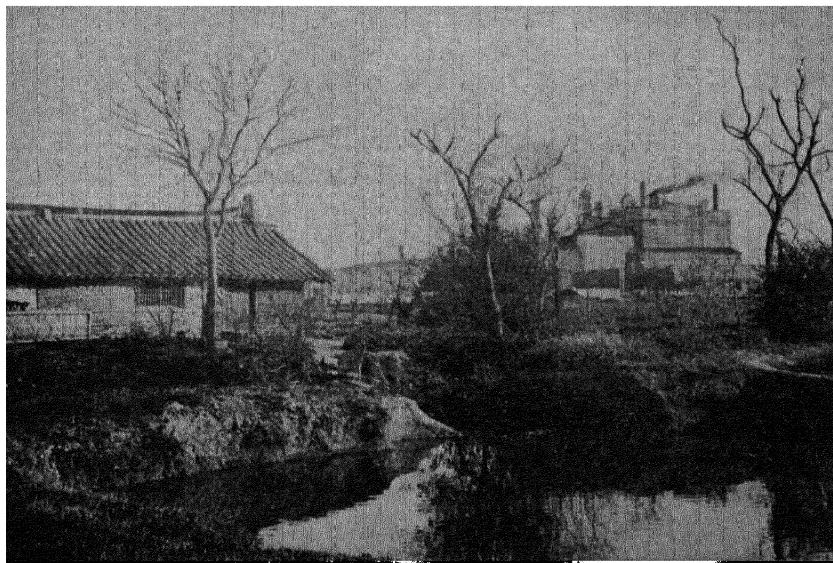


FIG. 5.—The edge of Shanghai. Few cities in the world present such abrupt transitions between industry and agriculture as are to be found in China's leading port. Giant factories cast their shadows in the canals of typical farms.

The amazing economic developments which are transforming parts of the country are shown in the following quotation from the 1932 report of the Chinese Maritime Customs.¹

“Nearly every large city and even many villages are now lit by electricity; modern gravitation water supplies are gradually

¹ Quoted in *The North-China Herald*, June 14, 1933, 403.

being produced; almost all cities have telephone systems, many with automatic exchanges, and almost all provinces have extensive long-distance telephone services; while the Government telegraph and wireless administrations serve the country most effectively. Street-widening has been the order of the day. The growth of factories, particularly textile, has been remarkable, and power plants have made electricity available for industries. More railway lines have been added, and urban, district and provincial motor highways are rapidly replacing the old footpaths, quickening and improving the means of transport. Rivers have been bridged and motor bus and truck services have taken the place of wheelbarrows. But anyone who knows China and the vast extent of her territory must realize what remains to be done."

The westernization of China, whether for good or bad, is sharply limited to portions of certain cities along the seacoast or navigable waterways, or those served by the few railways. Vast areas continue to live as in the days of the Ming dynasty. It is these contrasts in cultural development which make generalizations about China so unsafe and help to render the political tasks of the government so complex.

Many of these areal differences are tied up with basic factors of geography. Canton lies within the tropics, while northern Manchuria is but 13° from the Arctic Circle. In the far northwest the oasis of Turfan is nearly a thousand feet below sea level, while the glacier-clad mountains of eastern Tibet rise to over four miles. The coast of Fukien has a rainfall of 75 in. a year, while Inner Mongolia seldom receives more than 10 in. The permissible growing season ranges from scarcely three months in the far North to a full year in the extreme South, thus enabling the more favored areas to produce two and three crops as against one elsewhere.

One of the most important factors underlying China's problems is the unfavorable topography which characterizes so much of the landscape. Too large a part of the territory is broken up by rugged mountains and unusable hills. Fertile plains are present along the lower Yangtze Kiang, in the great delta of the Hwang Ho, and in central Manchuria, but these three regions represent the only sizable tracts of good agricultural land. All of western and southern China is distinctly hilly or mountainous, which limits the possibilities of cultivation, restricts commerce and communications, and fosters sectionalism. Difficulties of travel in the interior make it easier for Shanghai and other coastal ports to communicate with Europe and America than with many sections of China itself.

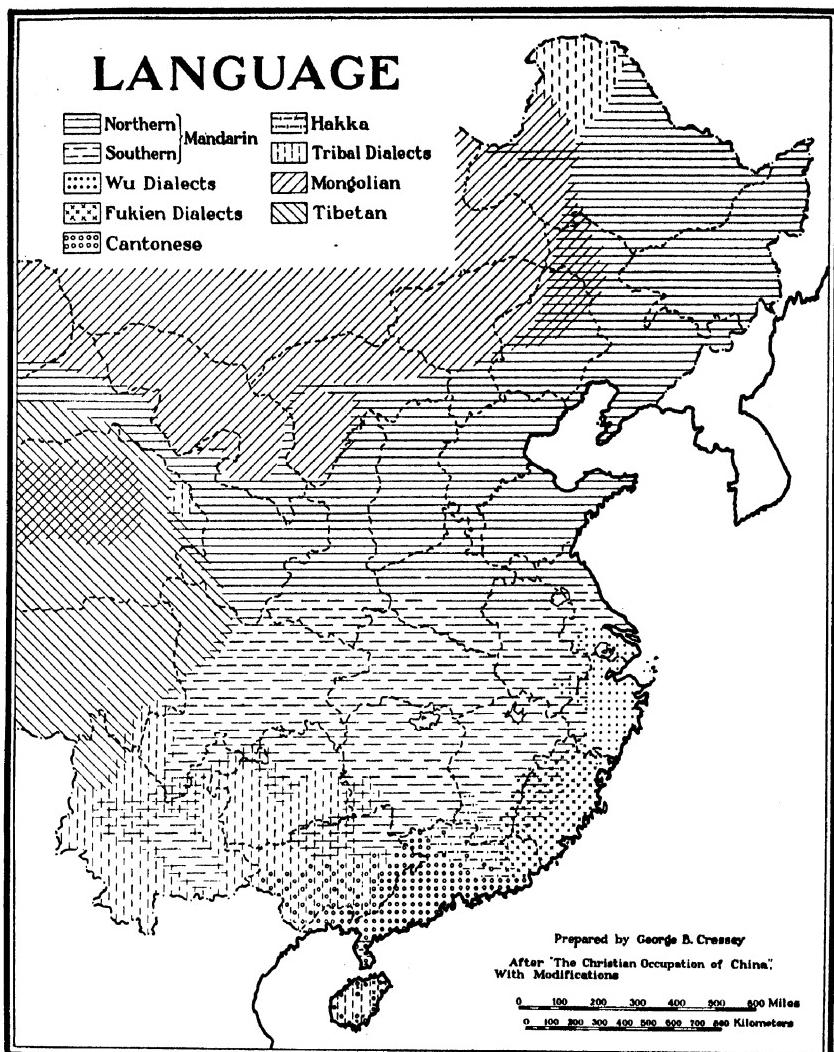


FIG. 6.—The confusion of dialects is particularly marked along the coast of South China, in contrast to the court language of Peking, known as Mandarin or *kuan hua*, which is used throughout the northern and central districts.

These features distinguish China from the settled areas of Europe and North America and break it up into dissimilar fragments. Were it not for China's comparative isolation in Southeastern Asia, there might be but little common culture and even less of political coherence.

The unity and homogeneity of the Chinese race have frequently been emphasized. While there is a sense in which this is true, it is quite as important to point out the great variations which exist in language, physical appearance, and psychology. The Chinese of



FIG. 7.—Cities in the North and South present vivid contrasts in their street life. This scene in Shantung reflects the widespread use of carts and riding animals in northern China. (*Ato Photographic Association.*)

Shantung and Kwangtung have little more in common than the French and the Italians and might have equal difficulty in understanding each other. The province of Fukien alone is reported to have no less than 108 dialects.

The people of Kwangtung are shorter in stature than those elsewhere in China. Numerous measurements in South China by Shirokogoroff¹ show that the average height is 1,609.2 mm., as compared

¹ SHIROKOGOROFF, S. M., "Anthropology of Eastern China and Kwangtung Province."

with 1,642.4 mm. for East China and 1,665.7 for North China. There is thus an average difference of 2.1 in. between the Cantonese and the people of the northern plains. In addition there is a more pronounced development of the almond eye, with a percentage of 36.4



FIG. 8.—Many of the streets of South China are narrow and paved with stone slabs, beneath which usually runs a drain. Even Shanghai has some streets such as this, scarcely wide enough for a rickshaw. (*The Photo Bureau.*)

in Kwangtung compared with 23.4 per cent in Kiangsu and 11 to 21 per cent in North China. The head of the Cantonese is smaller, the face shorter with a relatively high forehead, and the skin is slightly darker than is common for people farther north.

THE NORTH AND THE SOUTH

There are two Chinas, each with distinct characteristics in sharp contrast to those of the other. Many years ago Marco Polo was so impressed by these contrasts that he gave the two sections separate

names. The North he called Cathay, while the South he named Manji. Although both parts have many qualities in common, no observer can travel overland from Peiping to Canton without finding great differences in the geographic environment.

One China is in the South, a land of abundant rainfall. There are many hills, but every bit of level land is intensively cultivated. This is the land of canals and paddy fields, of rice and bamboo, of teeming populations crowded into cities with narrow streets. Here the people are shorter in stature and speak a multitude of dialects. The South tends to be radical and revolutionary, while the North is stolid and conservative.

The other China is in the North, a land of limited and uncertain rainfall, with large areas of level land, but with precarious agriculture and frequent famines. In place of rice and the wet agriculture of the South the standard crops are millet and kaoliang and beans. In place of the greenness of the South, this region is brown and dust blown for much of the year. In place of canal boats and coolie carriers are two-wheeled carts and draft animals. While the population is dense, the cities are not so crowded as in the South, and there are wide streets. The people are taller and speak a uniform dialect, the Kuo Yu or Mandarin. Here is the land of Confucius and the sages—the classical China.

The South is green, while the North is characteristically brown and dusty. Most important of all, the growing season in the North is but four to six months, while in the South it is nine months to a year. Thus, while the North produces one crop, or in some places two, the South raises two or three. This means less likelihood of famine and greater prosperity. These differences are so distinct that they divide China into two great geographic units, as dissimilar as many countries. Out of these contrasts have developed social, economic, political, and even racial differences which will be discussed in the following chapters.

In order to make these differences more vivid, they are presented in tabular form in the accompanying table. Generalizations such as these have a real value only if it is remembered that they are intended to present striking contrasts rather than to indicate absolute characteristics throughout the whole of a given region. The value of this comparison lies in its graphic contrasts.

Some writers have suggested a threefold division of China, following the main river valleys, but such a grouping leaves out Manchuria and other areas and does not recognize the essential unity of the central and southern provinces.

of the land is the distinguishing feature in guiding man's economic activities and cultural interests, for topography modifies soil, climate, and agriculture. In establishing the fifteen regions which form the chief contribution of this book, human adjustments are the guide; but in describing these relationships, climate or agriculture or topography is variously emphasized according to its local importance. The divisions of the writer were first published in the third preliminary edition of "The Geography of China" at the University of Shanghai in 1928.¹



FIG. 9.—Canals and canal boats take the place of roads and vehicles in many parts of South China. This view is in Kashung, near Shanghai. (*The Photo Bureau.*)

THE PRESSURE OF POPULATION

Wherever one travels in China there are people. Just how many there may be no one knows, but one cannot journey through the

¹ Other regional analyses may be found in the following sources:

BUXTON, L. H. DUDLEY: "China, the Land and the People" (1929), 197-247.

LITTLE, ARCHIBALD: "The Far East" (1905), 10-218.

RICHARD, L.: "Comprehensive Geography of the Chinese Empire" (1908), 21-237.

ROXBY, PERCY M.: *Geographical Review*, XV (1925), 1-24.

SION, JULES: "Asie des Moussons" (1928).

STAMP, L. DUDLEY: "Asia" (1929), 481-515.

WAGNER, WILHELM: "Die chinesische Landwirtschaft" (1926), 2.

interior without receiving vivid impressions of the teeming millions who inhabit this land.

Statistics of all kinds are exasperatingly unreliable in China. No precise census enumeration has ever been taken, and many of the published figures are based on such generalizations as the average consumption of salt or other products, upon the circulation of mail matter, or upon estimates as to the number and size of families. In most instances, population or agricultural data are given only by provinces and little information is available as to the method of computation. Where figures are published by hsien, or counties, they are usually based upon the judgment of local magistrates or postmasters. Population figures have often formed the basis of subsequent taxation and have thus been deliberately misstated. In many cases, too, it has been customary to omit all children under one year, and occasionally all girls below five. Such scattered estimates as are available for earlier periods are of doubtful meaning, as there is often uncertainty concerning the exact area to which they apply.

During the first year of the Christian era the population¹ was estimated to number some 55 millions, and by 1712 it appears to

¹ The following references deal with population:

CHANG, C. C.: Estimates of China's Farms and Crops, *Statistical Monthly* (Nanking), (January-February, 1932).

CHEN CHANG-HENG: Some Phases of China's Population Problem, *Bulletin de L' Institut International de Statistique*, Tome XXV, 2ème Livraison, Tokyo (1931), 18-54.

* CHEN, WARREN H.: An Estimate of the Population of China in 1929, *Bulletin de L' Institut International de Statistique*, Tome XXV, 2ème Livraison, Tokyo (1931), 55-87.

CONDLIFFE, J. B.: "China To-day: Economic," 5-18.

Directorate General of Posts, Ministry of Communications: "List of Post Offices, Twelfth Issue," Shanghai: Post Office (1926).

LIEU, D. K.: A Brief Account of Statistical Work in China, *Bulletin de L' Institut International de Statistique*, Tome XXV, 2ème Livraison, Tokyo (1931), 88-121.

ROCKHILL, W. W.: The 1910 Census of the Population of China, *T'oung Pao*, XIII (1912), 117-125; and *Bulletin American Geographical Society*, XLIV (1912), 668-673.

———: Inquiry into the Population of China, *Smithsonian Miscellaneous Collections*, XLVII (1905), 303-321.

ROXBY, PERCY M.: The Distribution of Population in China, *Geographical Review*, XV (1925), 1-24.

STAUFER, MILTON T.: "The Christian Occupation of China."

THOMPSON, WARREN S.: "Danger Spots in World Population," New York: Knopf (1929), 49-70.

TORGASHEFF, BORIS P.: Town Population in China, *China Critic*, III (1930), 317-322.

TYAU, M. T. Z.: "Two Years of Nationalist China," Shanghai: Kelly and Walsh (1930).

have risen to 120 millions. In 1900 the Imperial Government reported 440 millions, but in 1910 the estimate dropped to only 330 millions. This last figure now appears to have been a deliberate underestimate and is open to criticism on several grounds. Since the establishment of the Republic in 1911, the figures have consistently exceeded 440 millions and have risen as high as 485 millions. In 1923 the Post Office published itemized figures collected by local officials, apparently without detailed supervision, which totaled 440 millions. New estimates in 1926 raised the figure to 485,508,838. In both cases, the Post Office estimates did not include Outer Mongolia or Farther Tibet. The Maritime Customs figure for 1930 amounts to 444 millions. In 1931 the Ministry of the Interior, on the basis of local reports, estimated the total population at 474 millions.

In addition to these official figures, various modifications have been proposed by Chinese and foreign scholars. Missionary estimates contained in an important volume entitled "The Christian Occupation of China" (1922) exceed 441 million. D. K. Lieu (1930) places the total at between 470 and 480 millions, while M. T. Z. Tyau (1930) estimates the population at 463 millions. Warren H. Chen (1930) arrives at a total of 445 millions, while Chen Chang-heng (1930), after careful survey of all available data, favors about 457 millions. On the other hand, Walter F. Willcox (1930) of Cornell University adopts the 1910 census as a basis and provisionally favors 323 millions. The weight of the evidence, together with the conclusions of most scholars intimately familiar with China, indicates that China has a population of at least 450 millions, possibly more rather than less.

The civil warfare, banditry, floods, and droughts of the years following 1925 have taken a terrific toll of human life; but while some areas have been seriously reduced in population, recuperation is rapid and there is no indication of any permanent reduction. The birth rate is certainly high, estimates ranging from 42 to 50 per thousand, so that there is probably a considerable increase in population even in the face of exceptionally high death rates. With a country the size of China, such a natural increase amounts to impres-

WILLCOX, WALTER F.: China's Population—400,000,000 or 300,000,000? *Chinese Students Monthly*, XXII (1926), 23-29.

———: A Westerner's Effort to Estimate the Population of China and Its Increase since 1650, *Journal of the American Statistical Association*, XXV (1930), 255-268.

———: The Population of China in 1910, *Journal of the American Statistical Association* (March, 1928), 18-30.

WONG, W. H.: "The Distribution of Population and Land Utilization in China," Shanghai: China Council, Institute of Pacific Relations (1933).

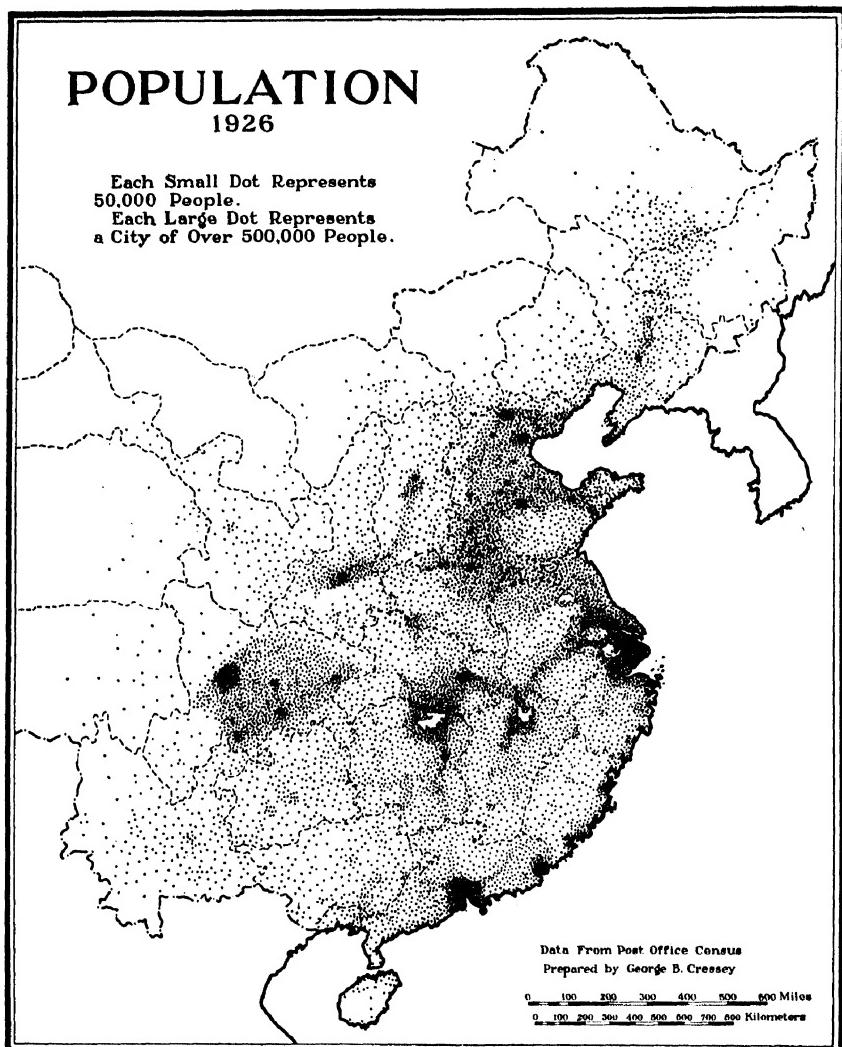


FIG. 10.—Four hundred and eighty-five million human beings. Compare their distribution with the map of cultivated land (Fig. 46, on p. 91).

sive figures. After considering the available evidence, Condliffe considers it not improbable that China is increasing at the rate of 37 million per decade.

The figures used in this book for regional comparisons are those of the Post Office for 1926, which are the most recent estimates covering all China by individual hsien, or counties. Since the geographical

regions with which subsequent chapters deal cut across provincial boundaries, it is necessary to use statistics which are given in terms of hsien and may thus be recombined into geographical areas. The 1926 Post Office estimates are the largest figures yet proposed and may need to be slightly reduced. They are apparently of the right order of magnitude and furnish a valid basis for comparisons between regions.¹

Probably the best indication of the percentage of people who live on farms is found in the figures of the Directorate of Statistics for 1932² which list the number of farm households as 58,579,181 or 74.5 per cent of the total. The extent of the rural population has been estimated in another manner by Torgasheff,³ who states that there are 112 cities with over 100,000 inhabitants, 467 known cities between 100,000 and 25,000, and 1,443 other cities of unknown size, so that the total urban population is "hardly less than 100,000,000, that is, not less than 20 per cent of the total population," thus leaving 80 per cent rural. It thus appears safe to say that approximately three-fourths of the population is engaged in agriculture.

Except in portions of northern Manchuria, almost all land suitable for cultivation is utilized to the limit. Even in remote valleys amid almost inaccessible mountains the industrious farmer has taken advantage of every possibility of tilling the soil. The experience of the writer and that of others who have traveled extensively in China agree on this point. Contrary to certain misconceptions, China does not possess vast areas of good unused agricultural land. There are, to be sure, large tracts with but a scanty population, but these regions are too dry or too cold or have too infertile a soil to support many more people than they now have. Merely to state that six-sevenths of the population are concentrated in one-third of the area is to give the impression that the population problem is largely one of maldistribution. The fact is that two-thirds of the country has the capacity to support a population only one-sixth as great as the remaining third. All parts of China are essentially filled to their capacity under available methods of production.

Figures as to the average density of population are quite misleading unless the characteristics of the area to which they apply are understood. In terms of Greater China, that is, including all of Mongolia and Tibet, the density of 120 per square mile compares favorably with other settled lands and no overcrowding is evident. If the area is restricted to the twenty-eight provinces of China—which excludes

¹ See Table II (p. 55).

² *Statistical Monthly* (Nanking), (January–February, 1932).

³ TORGASHEFF, BORIS P., *China Critic*, III (1930), 317–322.

Outer Mongolia and Farther Tibet—the figure rises to 156 per square mile which is not excessive, being comparable with Ohio or Scotland. Much of Provincial China, however, is semiarid or mountainous and the great mass of the population is restricted to the eastern half



FIG. 11.—In a land as crowded as China, what can be the future of these cheerful children? (*China Famine Relief*.)

which may be termed Agricultural China. Here the density is 326 per square mile or equal to that of Germany. Even this figure might not be serious if there were a uniform spread of the population, or if agricultural income were supplemented by industrial activities.

It is only when smaller units are examined, such as political provinces or geographic regions, that the true picture is revealed. In such areas as the North China Plain, there are no less than 647 people to each square mile, while in the delta of Yangtze Kiang the concentration is probably three times as great. Perhaps the truest picture of popu-

lation congestion is to measure not the total area but only the cultivated land, for it is from the products of the soil that city dweller and farmer both must be fed. Here the most amazing figures appear. For all of Agricultural China there are an average of 1,479 people to each square mile of cultivated land. Fishing and herding may locally supplement the food supply, but the bulk of these people must obtain their entire livelihood from the products of the soil. Such a concentration is more graphically appreciated when it is realized that 1,479 people per square mile of cultivated land means an average of only 0.43 acre per person.

Is China overpopulated? The answer to this fundamental question not merely concerns the potential food supply but directly involves the standard of living. If mere subsistence is the goal, China can unquestionably provide food and shelter for five hundred millions or more. If, however, a standard is chosen which will provide for universal education, material comforts, and the advantages of culture which come with travel and reading, then a much larger per capita income will be required. Whether China can adequately increase her national wealth is a problem of major importance.

The Malthusian principle of population control is centuries old in China. During times of peace and plenty, the desire to propagate large families, as advocated by Confucius, has built up the population to the limits of the productivity of the land. Then during the periods of rebellion, civil chaos, and flood or drought, which have recurred so often in China's history, millions have perished, only to be replaced by others when favorable conditions returned. Famine has often resulted merely from the normal increase of the population overtaking the available food supply. In Europe the Malthusian doctrine has been temporarily sidestepped by colonization and the development of industry and foreign trade. These possibilities have been practically exhausted by the old countries of Europe, though not so completely by the United States. They do not appear to be available for China on any significantly adequate scale.

Too many of China's millions live on a dangerously low standard. If China is to increase in material prosperity, it seems inevitable that there must be a lower birth rate. This situation was long ago realized by Dr. Sun Yat-sen who wrote in 1894 to Li Hung-chang as follows.¹

“At present China is already suffering greatly from over-population, which will bring impending danger in its wake. She is

¹ Quoted by Chen Chang-heng, “Some Phases of China's Population Problem,” 23.

confronted with a great many hidden uprisings and frequent famines. It is extremely difficult for the populous masses to make a living even during good years, and in time of great drought and famine, many people will starve to death! Our food problem is already very acute. The situation will be much worse as time goes on. If we take no timely means of remedy, it will surely worry us."

A realization of the dangers of overpopulation is by no means new. The great philosopher Mencius once said, "An increasing population over a long period of time brings about strife and disorder."¹ Even twenty-four centuries ago, Han Fei-tzu of the Chou dynasty described the effect of increasing numbers on prosperity.¹

"In the ancient times people were few but wealthy and without strife; the government gave no rewards or punishment because people were self-controlled. People at present think five sons are not too much, and each son has five sons also; and when the grandfather is not dead there are twenty-five descendants. Therefore, people are more and wealth is less; they work hard and receive little. Even if the government uses twice as much reward and twice as much punishment strife cannot be prevented. The wealth of a nation depends upon people having enough food, not upon the number of people."

COMMUNICATIONS, OLD AND NEW²

Inaccessibility and poor communications have handicapped China for centuries. Except where railroads or modern automobile service is

¹ Quoted by John Lossing Buck, "Chinese Farm Economy," 353.

² The following references deal with communications:

BAKER, JOHN EARL: Transportation in China, *Annals American Academy of Political and Social Science*, CLII (November, 1930), 160-172.

BRIGHT, WILLIAM (editor): Inland Communications in China, *Journal North China Branch of the Royal Asiatic Society* (1897), 1-213.

Bureau of Economic Information: Roads in China, *Chinese Economic Monthly*, II, No. 2 (1924), 14-32.

———: Development of Communications in China, *Chinese Economic Monthly*, II, No. 14 (1925), 31-46.

CHEN MING-JU: "The Influence of Communications, Internal and External, upon the Economic Future of China," London: George Routledge (1930).

CLARK, GROVER: "Economic Rivalries in China," 18-33.

SMITH, A. VIOLA: "Motor Roads in China," Washington: Bureau of Foreign and Domestic Commerce, Trade Promotion Series 120 (1931).

SOWERBY, ARTHUR DE C., and others: Transportation in China, *China Journal*, X (1929), 217-279.

TODD, O. J.: Modern Highways in China, *Far Eastern Review*, XVII (1921), 526.

available, travel is on foot, by sedan chair, on muleback, in two-wheeled carts, or by boat. Twenty miles a day is a good average, and in place of a journey of a few hours as by rail one spends days jolting along in a two-wheeled cart. Distances are appropriately measured in time units rather than by space relationships. The map of China is not to be compared with that of Europe or the United States. Single provinces in China are larger in time units than whole countries in the West.

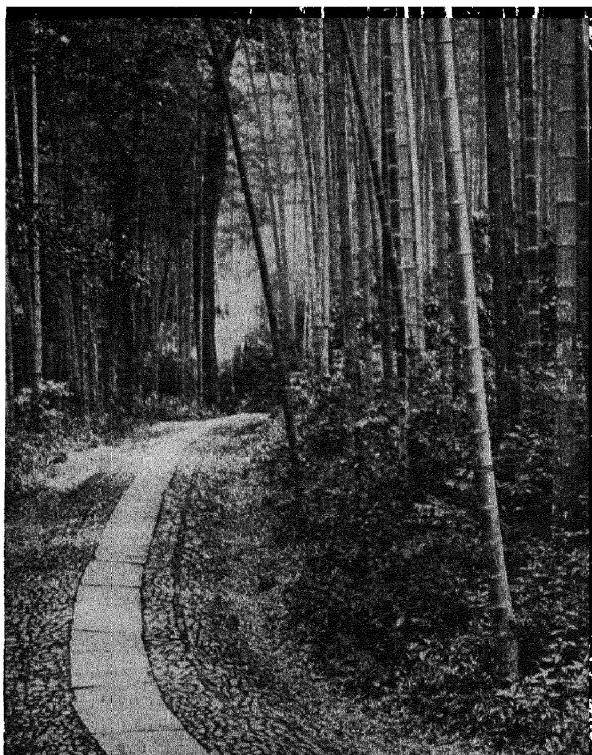


FIG. 12.—Flagstone trails winding through groves of bamboo or between the rice fields are the main overland thoroughfares south of the Central Mountain Belt. (*Auto Photographic Association.*)

Over large sections of hill country, commerce is carried on on the backs of men, the strongest of whom can carry a hundred pounds between fifteen and twenty miles in a day. Mules, horses, and donkeys eat about as much as a man in proportion to the load they carry and are therefore to be found only where grass or rough fodder is available. Where animals must be fed grain, there is a direct competition between

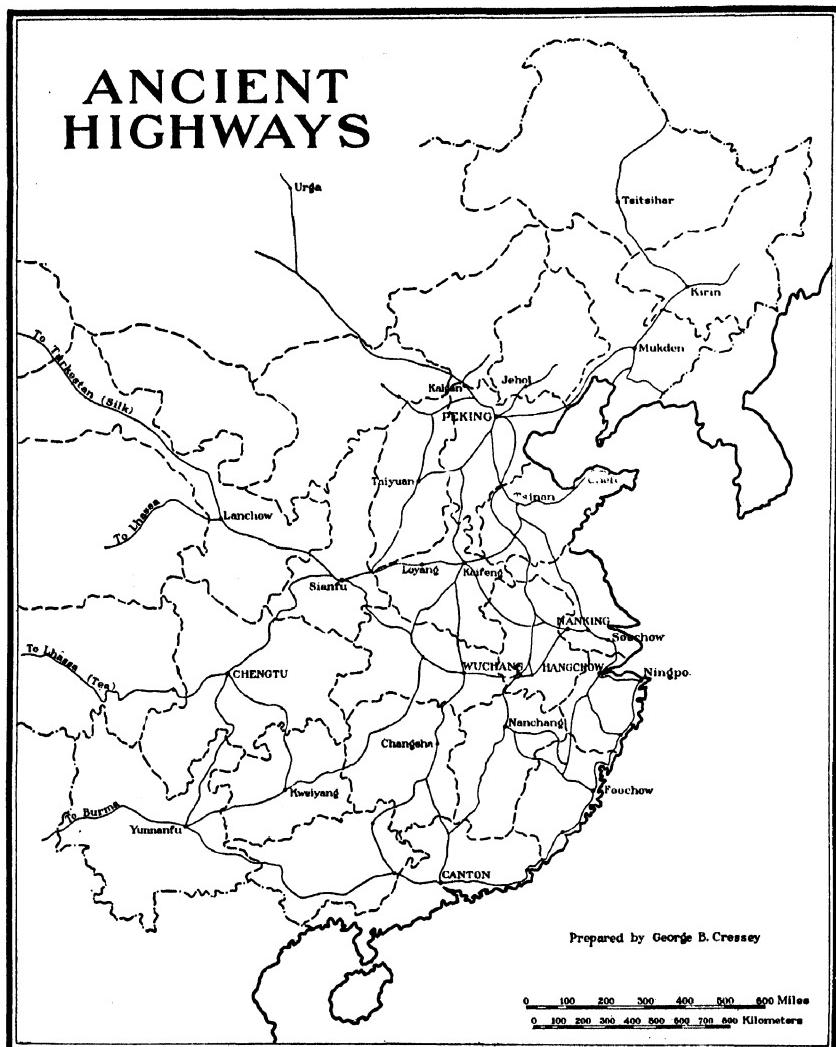


FIG. 13.—The Chinese Empire was linked together by a network of ancient highways centering at Peking, and connecting the various provincial capitals. A few of the above lines represent waterways.

coolie carriers and animal transport, and prices are forced down to a level of bare existence. Transport which appears cheap per day is nevertheless expensive per mile, and farmers seldom take their grain or cattle more than thirty miles to market.

(China has long ago adjusted her modes of transportation to the geographic setting. Thus wheelbarrows are used in the more crowded

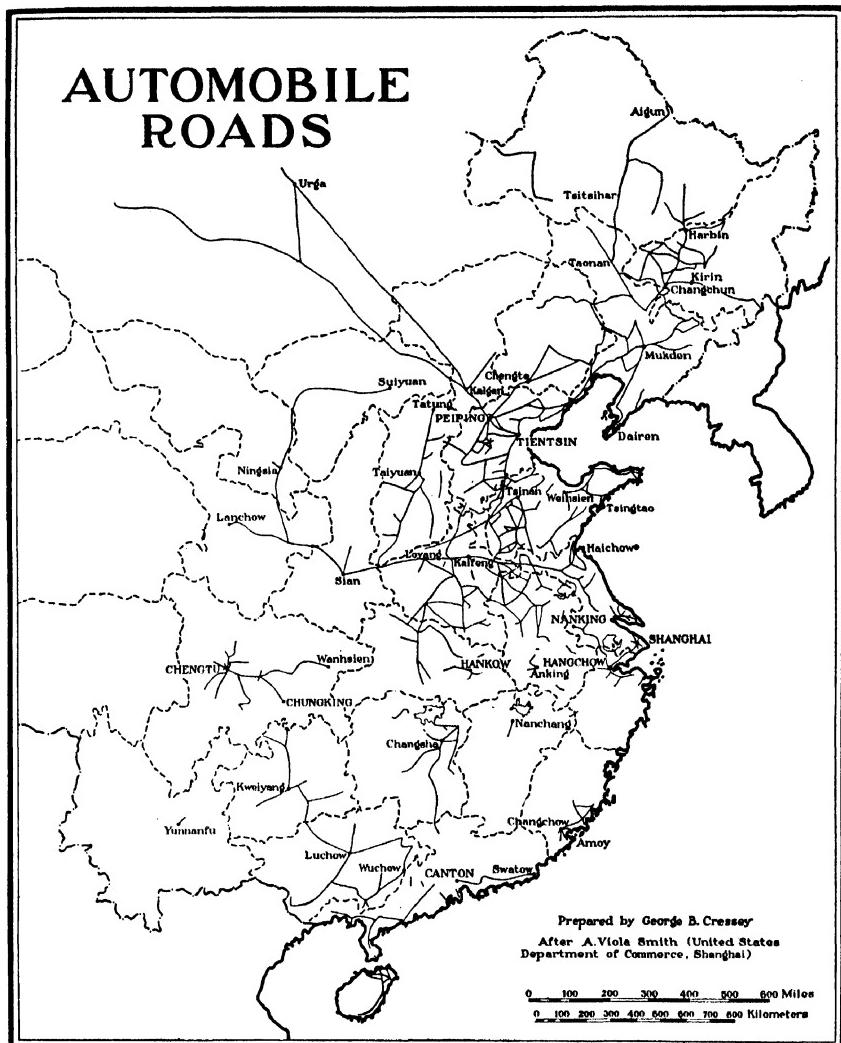


FIG. 14.—Modern China is increasingly making use of the automobile. The greater mileage of new roads in the North is due to the presence of old cart roads which can be adapted to motor traffic.

plains and two-wheeled carts drawn by animals appear in the less thickly settled plains. Camels furnish transportation in the desert and canal boats are pulled by trackers along the banks in the Yangtze Delta.)

Since early times it has been the custom for the Emperor to appoint provincial governors who were natives of another part of the country,

and they in turn have selected local magistrates from a distance in order to reduce the possibilities for dishonesty. Military movements and the forwarding of taxes have also required adequate transportation. As a result, there has grown up a system of highways, often kept in repair by imperial support. These radiated from Peking to the provincial capitals; each of which in turn was connected with its neighbors. Perhaps the most famous route of travel was the Grand Canal, built to carry tribute rice from the Yangtze Delta to the court at Peking.

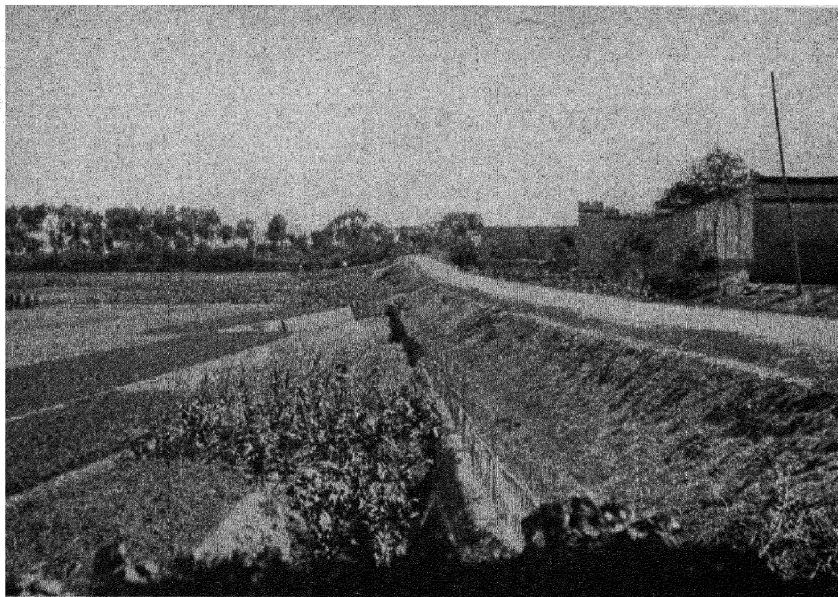


FIG. 15.—This motor road south of Taiyuanfu in Shansi was one of the first to be built. Like most of China's new highways, it is unpaved. (*China International Famine Relief Commission.*)

A striking indication of the many changes which are taking place in the new China is found in the construction of automobile roads, some forty thousand miles of which are now available. Road building was first undertaken by famine-relief agencies in order to provide work for those who needed employment and to make possible the shipment of food into stricken areas. The second stage in road building came when roads which had definite military value were built by soldiers. Within recent years civil governments have been active, and thousands of miles of highways have been built for motor-bus service. The distribution of these roads is shown in Table I.

The construction of these roads is much easier in the North where more of the land is level and where old cart roads have been remade with a minimum of grading. Highway construction in the South is handicapped by unfavorable land forms and by the many canals and rivers which need to be bridged. Few of the roads are paved, and it is often necessary to suspend traffic during the rains.

In many remote areas where gasoline is expensive, the roads are but little used; elsewhere travel is becoming popular. Over a quarter of all the automobiles in China are in Shanghai, and many of the remainder are used exclusively in other port cities.

The first railway was built in 1876 between Shanghai and Woosung but met with such disfavor that it was soon torn up and shipped to

TABLE I.—AUTOMOBILES AND AUTOMOBILE ROADS

Province or district	Mileage of automobile roads ¹	Automobiles, including busses, trucks, and motor cycles ²	Province or district	Mileage of automobile roads ¹	Automobiles, including busses, trucks, and motor cycles ²
Heilungkiang..	1,195		Hupei.....	403	726
Tsitsihar....	1,620		Szechwan.....	1,808	414
Kirin.....	1,230	7,497	Chekiang.	1,026	717
Liaoning.....	1,388		Kiangsi.....	403	107
Jehol.	1,351		Hunan.....	801	182
Chahar.....		82	Kweichow.....	2,296	50
Suiyuan.....	1,447	165	Yunnan.....	795	44
Ningsia.....	1,038	25	Fukien.....	867	930
Hopei.....	872	3,905	Kwangtung.....	4,772	3,197
Shansi.....	1,308	391	Kwangsi.....	1,640	185
Shantung.....	1,633	1,544	Hongkong.....	.....	3,261
Honan.....	1,903	181	Dairen.....	.....	1,605
Shensi.....	1,269	235	Macao.....	.....	285
Kansu.....	2,003	51	Kwangchowwan.....	.....	101
Sinkiang.....	766	44	Outer Mongolia.	1,516	
Kiangsu.....	2,588	17,790		39,350	43,854
Anhwei.....	1,292	140			

¹ *Shanghai Sunday Times* (Nov. 12, 1932). The total may be compared with the estimate of A. Viola Smith, personal communication of May 18, 1932: "The mileage of highways in China is still approximately 40,000 including caravan routes in Manchuria and Mongolia, as well as highways in the foreign concession areas and Hongkong. There has been a bit of development going along since early 1930, but in the main it has not added a great deal to the total mileage. Other mileage which has been entirely wiped out by floods in Honan, Hupeh, Anhwei and Northern Kiangsu would about offset such new mileage as has been built."

² SMITH, A. VIOLA, "Automotive Census of China," Shanghai: U.S. Department of Commerce (1932).

Formosa. Further construction did not take place until just prior to the beginning of the present century. Most of the early lines were built by foreign companies under political concessions, such as those of the Russians in Manchuria, the French in Yunnan, and the Germans in Shantung.

The total length of China's railways at the end of 1930 amounted to 17,488 km. (10,867 miles).¹ This represents an 84 per cent increase since the establishment of the Republic in 1912, most of which has been in the northeast. Numerous extensions have been built elsewhere but no essentially new or important line has been constructed south of the Great Wall since 1912.

(Forty per cent of the total mileage is in Manchuria where the Russian built Chinese Eastern, the Japanese South Manchuria, and numerous new Chinese lines provide the most complete network in the country. New construction has been especially active since 1925.)

The principal railways between the Great Wall and the Yangtze are the Peiping-Liaoning, formerly the Peking-Mukden, the Peiping-Suiyuan which extends westward to the Hwang Ho and Mongolia, the Tientsin-Pukow which provides through service from Peiping to Nanking, the Peiping-Hankow, the Lung-Hai from the new port of Haichow in northern Kiangsu westward to Sianfu in Shensi, and the Shantung Railway from Tsingtao to Tsinan. There is also a narrow-gage line into Shansi. Many of these lines radiate from the Peiping-Tientsin area and give it excellent rail facilities.

Railways south of the Yangtze are short and scattered. Shanghai has lines extending south to Hangchow and west to Nanking, where a train ferry makes connection with the Tientsin-Pukow Railway. Through rail service enables one to reach Berlin from Shanghai in two weeks. Three short lines radiate from Canton, one of which will eventually link South China with Hankow and Peiping. A narrow-gage line links Yunnan with French Indo-China. The mountainous character of the South has retarded rail construction which has largely kept to the level land of North China.

UNDERSTANDING CHINA

How may one adequately understand China? It is a country and a civilization in one—so vast and intricate that few, whether Chinese or foreign, can comprehend it all. One would need to travel tens of thousands of weary miles during many years to visualize fully the areal scene, while to appreciate the heritage of the centuries is even

¹ CLARK, GROVER, "Economic Rivalries in China," 18-33.

more difficult, especially for one of an alien culture. No dozen books can encompass China; much less can a few chapters portray the varied human adjustments of this ancient land.¹

The finest which China has to offer in art and life is probably found in Peiping. Here is China at her best. The dialect of the old court city is spoken throughout half the country, and Peiping has been the fountain of learning from which ideas have radiated to the entire nation. The yellow-tiled palace roofs, the quiet courtyards, the magnificent gateways through the city wall, and the inspiring Temple

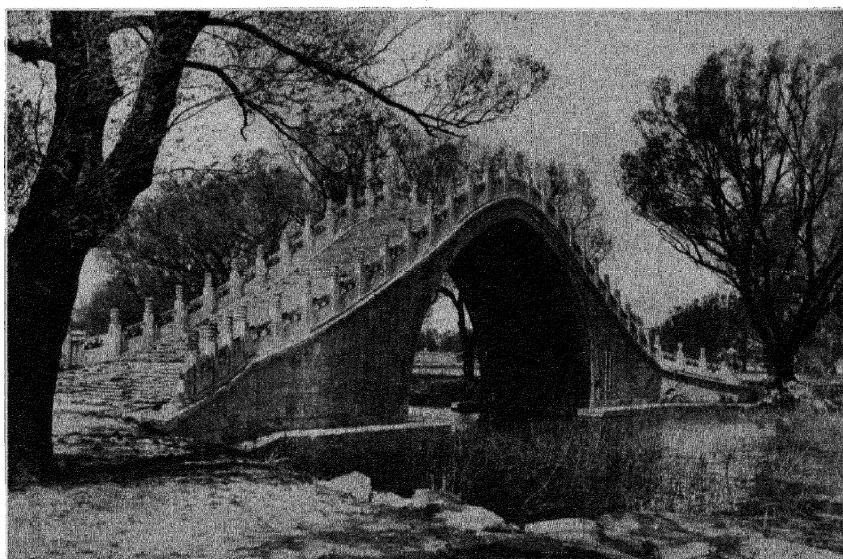


FIG. 16.—Peiping is China at its best. The grounds of the near-by Summer Palace contain numerous expressions of the architectural genius of the Chinese. (*Canadian Pacific Steamship Company.*)

of Heaven all tell the richness of a mature culture. To live in Peiping for a year is one of the world's choicest experiences.

But China does not have an urban civilization. The real China is rural, and it is among the farmers that one finds the genuineness which typifies this historic land. Country travel is fascinating, but

¹ "China is a vast empire, proverbially difficult to understand, no matter what the length of time may be which one has spent in it; therefore it is important to be on one's guard against those cheap and easy solutions of a difficult and complex problem, which, by misrepresenting some of the factors, omitting others, and remaining in total ignorance of yet more, may be able satisfactorily to explain everything about China in a few succinct and well-turned paragraphs."—ARTHUR H. SMITH, quoted in *Geographical Journal*, XXIX (1907), 174-175.

it is not ordinarily a simple matter of comfortable vehicles, good inns, or feast food. He who would know the real China must be willing to put up with many privations and difficulties, not to mention the danger of brigands. Three-fourths of the people live on farms and nearly all of the area of China lies outside city walls. If this book lays too little stress upon the increasing contribution of the new urban centers, it is because they still play a comparatively minor part in the



FIG. 17.—Landscapes such as this are characteristic of the alluvial plains of South China. Irrigated fields, distant mountains, abundant vegetation and industrious people. (*Dollar Steamship Company.*)

life of millions of square miles where the bulk of the Chinese actually live. A country as vast and old and populous as China changes but slowly.

Just what is the countryside like? Variations in rainfall and soil and land forms produce wide differences in crops and agricultural methods. One of the most striking characteristics of the Chinese countryside is the small-scale pattern of the cultural landscape. Fields are divided into gardens rather than farms. Roads are narrow even in the North, while in the South they shrink to foot paths. The

pressure of population is so insistent that all usable land is everywhere under cultivation. In all parts of the country one characteristically finds a nearness to nature and an intenseness of activity which betrays the reality of man's contest for existence. To understand the problems of China, one needs to appreciate not only the people and their history but the many intimate adjustments between human activities and the natural environment.

The most significant events in present-day Chinese history are not the all-too-frequent wars and famines which are reported in the newspapers. Economic, social, and intellectual changes are of much greater significance than the passing military and political drama. China moves slowly and it may be decades before she fully adjusts to the new world order of which she is just becoming aware. As to her eventual stability there can be little doubt. The panorama of Chinese history has been marked by a half dozen major dynasties, each characterized by stability and culture. Between these brilliant epochs have been intervals of chaos and confusion, often lasting for decades. It is an unfortunate coincidence that China should chance to have been caught in one of these times of stagnation just when the impact of the western world burst in upon her. The present is thus not a representative period by which to judge the Middle Kingdom.

CHAPTER II

TOPOGRAPHY SETS THE STAGE

THE GEOLOGICAL FOUNDATION

Topography forms the stage upon which the Chinese drama evolves. Behind the present physical landscape are ancient conditions, the foundations of which have been well described by Grabau.¹

"Underlying all of the rocks of China—beneath the sands of the great plains, under the loess of the valley bottoms, and below the solidified conglomerates, sandstones, shales, and limestones, which form so large a part of the modern mountains of China, and of its plateaus and valley bottoms—beneath all this mass of younger rocks, lies the ancient complex of crystalline formations which forms the foundation of the continent and to which belong the oldest rocks of China. Antedating them all, in point of origin, by so vast a period of time that it is not measurable in years or centuries, this rock complex challenges our attention, and bids us pause to note the inadequacy of human chronology when applied to the history of the earth itself. . . .

"Though underlying every part of China, these ancient rocks come to the surface only in relatively few localities. Foremost among these are the ancient land masses which have never been wholly submerged by the sea during any geological period. *Tibet* is one of these, and it is perhaps the most completely preserved of the permanent land masses, its ancient rocks being covered only by the still largely unconsolidated young sand, gravel, and loess deposits, or by Mesozoic deposits in part only of marine origin. To the east and southeast of the Chinese basin are the remnants of the old land of *Cathaysia*, which included not only the eastern margin of the present Asiatic continent, but also the islands lying east and south of it. On the continent, the granites, porphyries, and ancient crystallines of Kwantung, Fukien, and Chekiang and those of Shantung and Korea form remnants of this ancient mass. . . .

¹ GRABAU, A. W., "Stratigraphy of China," Part I, Peiping: National Geological Survey (1923-1924), 8-9.

"A third remnant of old land is found in Inner Mongolia, partly buried however by Tertiary sands and clays and by basalt flows. This constituted a part of the Palaeozoic old-land of *Gobia* which separated the Chinese basin from the geosyncline of Outer Mongolia."

Between these old land masses have been laid down great thicknesses of marine and continental sediments. Time after time shallow seas have spilled over the land, leaving behind their record in the form of limestones, sandstones, and shales, a sequence which is remarkably complete from the beginning of the Paleozoic up to the Jurassic or higher. Of particular importance are the widespread coal beds of the Carboniferous and again of the Jurassic.

Most of the mountain building of China apparently occurred during the Mesozoic era.¹ This activity is known as the Yen Shan movement, from its development in the mountains north of Peiping, and is divided into two phases. At the end of the Jurassic or the beginning of the Cretaceous there was a period of gentle folding followed by widespread volcanic activity. Later, in the Upper Cretaceous there were intense folding and thrusting. Opinion has varied among geologists as to the exact age of the great Tsingling system which extends eastward across central China. Von Richthofen and others have dated it as Late Paleozoic, but increasing evidence points to the Upper Jurassic. Yenshan mountain building also took place west and north of the Ordos Desert and eastward into Jehol forming the Yin Shan along the Mongolian border, as well as in Shansi and in the lower Yangtze Valley. The development of these Mesozoic mountains was accompanied by great accumulations of sediments, filling basins in northern Shansi, Shantung, and Szechwan.

¹ BLACKWELDER, ELLIOT: The Geologic History of China and Its Influence upon the Chinese People, *Smithsonian Institution Annual Report* (1913), 385-396.

SUESS, EDWARD: "The Face of the Earth," Oxford: Clarendon Press (1904-1924).

TING, V. K.: The Orogenic Movements in China, *Bulletin Geological Society of China*, VIII (1929), 151-170.

VON RICHTHOSEN, FERDINAND: "China," Berlin: Reimer (1889).

WONG WEN-HAO: The Mesozoic Orogenic Movement in Eastern China, *Bulletin Geological Society of China*, VIII (1929), 33-44.

———: Crustal Movement in Eastern China, *Proceedings Third Pacific Science Congress, Tokyo*, I (1926), 467-475; also *Bulletin Geological Society of China*, VI (1927), 9-36.

Additional information on Chinese geology will be found in the publications of the National Geological Survey and the Geological Society of China, both of Peiping, the National Research Institute of Geology of Shanghai, and the Geological Survey of Kwangtung and Kwangsi in Canton.

The geology of the mountainous country south of the Yangtze is still imperfectly known. Between the Yangtze and the streams which enter the sea at Canton is a mountain system of large extent but of low altitude, most of it being less than 3,000 ft. high and in no place exceeding 6,000 ft. It is clear that the region is complex, but the available evidence points to it, also, as having been formed during the Yenshan movement, with possible subsequent folding during the Mid-Tertiary at the time of Himalayan uplift farther west.



FIG. 18.—Mountains and water characteristically go together in Chinese art. (*Courtesy Harvard-Yenching Institute.*)

Quite recently, that is, during the Late Tertiary, there have been important folding and faulting in western China. These activities are still in operation as is shown by the disastrous earthquakes of 1920, 1928, and 1932 in Kansu and also in Yunnan in 1925. Associated with these modern mountains are several areas of sedimentary accumulation, such as the great subsiding plain of Hopei and Honan which extends across the Po Hai into southern Manchuria. Similar regions are found along the Yangtze both in its delta and in the Tungting and

Poyang Lake areas, which may be taken as modern illustrations of what central Szechwan was like during the Mesozoic.

Neither China nor Central Asia was covered by continental glaciers during the Pleistocene, so that there are none of the features common to the glaciated landscapes of Europe and North America.

A LAND OF MOUNTAINS

Mountains dominate the land forms of China. Level land is present in various deltas and in Mongolia, but elsewhere human activities are

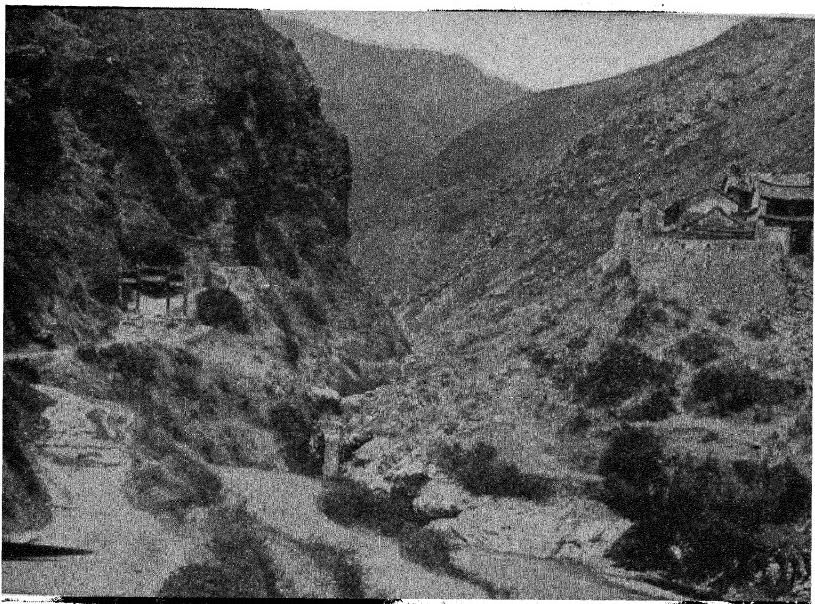


FIG. 19.—Southwestern China is a land of mountains and inhospitable landscapes.
(Asia Photographic Association.)

restricted by unfavorable topography, so that large areas are sparsely populated.

Many maps of China indicate mountains which do not exist. In other instances names are used which are unfamiliar even to local inhabitants. Little attempt has been made to standardize the nomenclature, and each range commonly has a variety of names. To add to the difficulty, large sections of mountainous country are without definite trend or orientation and no inclusive term is generally applicable. In the absence of precise surveys, map makers have fallen back on the travel notes of various explorers. Where some one's journal reads, "All during the afternoon we could see the rugged peaks of a

mountain range to the southwest which our cart drivers called the South Mountains," cartographers have proceeded to sketch in the appropriate legend. Other travelers have listed different names, so that most maps are compilations from a variety of sources, some authentic and others unreliable.

The mountains of China may be thought of diagrammatically as fingers reaching out from the Tibetan plateau, which forms the palm of the left hand. The thumb, held uppermost and partially opened, may represent the Tien Shan which enclose the Tarim Basin of Sinkiang to the south. Across northern Tibet and continuing eastward into China are the ranges of the Nan Shan and Kun Lun Mountains separated by the Tsaidam Swamp and the azure lake of Koko Nor; these may be represented by the first and second fingers. In between the second and third fingers would be the Red Basin of Szechwan. From here on the analogy does not hold so well. Perhaps it would be better to combine the third and fourth fingers to indicate the extensive but low and indefinite Nanling which extend across South China eastward and northeastward to the Pacific. Or the little finger might indicate the mountains south of the Si Kiang which reach eastward to Canton and are the shortest of the various mountain chains, just as those represented by the middle finger, the Tsingling, are the most important.

Greatest of all the mountains of China is the eastward extension of the Kun Lun, known in China collectively as the Tsingling Shan, which reach eastward from Tibet nearly to the Pacific. These mountains divide China into two major geographic regions, characterized by striking contrasts in climate, agriculture, and human activities. The Kun Lun system continues eastward into Japan and westward through Tibet, a total distance of over thirty-five hundred miles.

Within the limits of the Tibetan plateau, the easternmost section of the Kun Lun is the Amne Machin Range. In southern Kansu and along the borders of Szechwan the system is known as the Min Shan and is snow clad and alpine. Eastward the mountains divide, with the Tsingling proper between the Wei Ho and Han Kiang, and the Tapa Shan farther south along the boundary between Shensi and Szechwan. The latter, also known as the Kiulung or Kiutiaoling, are less important than the Tsingling. In western Hupei these mountains are called the Wu Shan, and through them the Yangtze has cut its great gorges above Ichang. The Tsingling are composed of granitic ridges in the north and folded sedimentaries in the south. They extend from within Kansu to the borders of Anhwei. In the vicinity of Sianfu the northern face of the mountains is especially precipitous and one

of the higher peaks is the sacred Hwa Shan. The mountains are continued eastward in Honan as the Funiu Shan, culminating in the Sung Shan in the angle between the Hwang Ho and the Peiping-Hankow Railway. In Honan there is the break in the Kun Lun system and the mountain trend turns abruptly southward and swings in a great crescent between the Hwai and the Yangtze. This range is known as the Hwaiyang Shan.

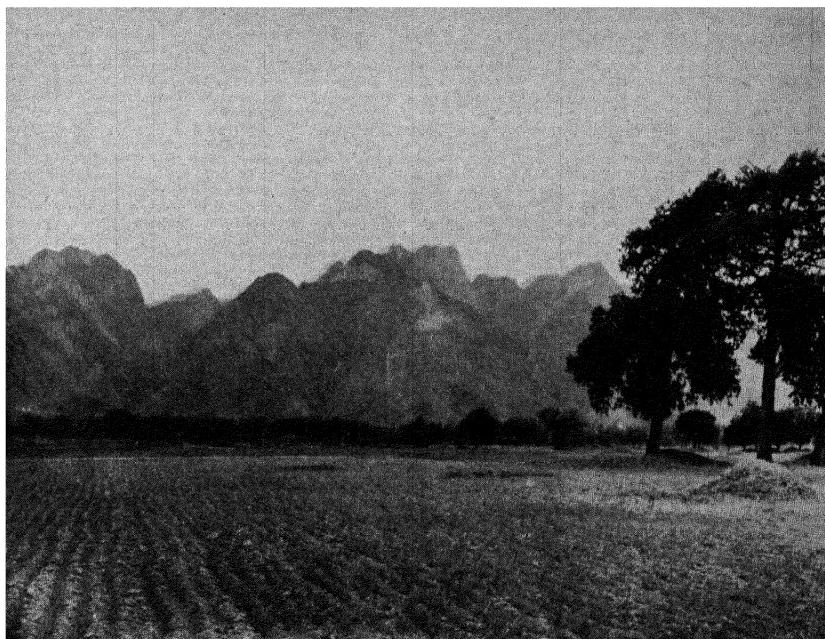


FIG. 20.—Hua Shan and the valley of the Wei Ho in central Shensi. This range forms the northern face of the great Tsingling Mountains. (*Bailey Willis.*)

To the east of the Tsingling proper, the Funiu Shan south of the Hwang Ho in Honan are balanced by the Taihang Shan to the north which swing northward through eastern Shansi, finally to join the indefinite Yin Shan near Peiping. An important mountain group in northern Shansi indirectly related is the Wutai Shan. Eastern Kansu contains the diagonal range of the Liupan Shan which ties the Tsingling with the Nan Shan system to the northwest.

In their eastward extension from Tibet, the Kun Lun system becomes progressively lower and lower. The Min Shan rise to over 15,000 ft., while the Tsingling only locally exceed 10,000 or 12,000 ft. The Funiu are under a mile and the Hwaiyang commonly below

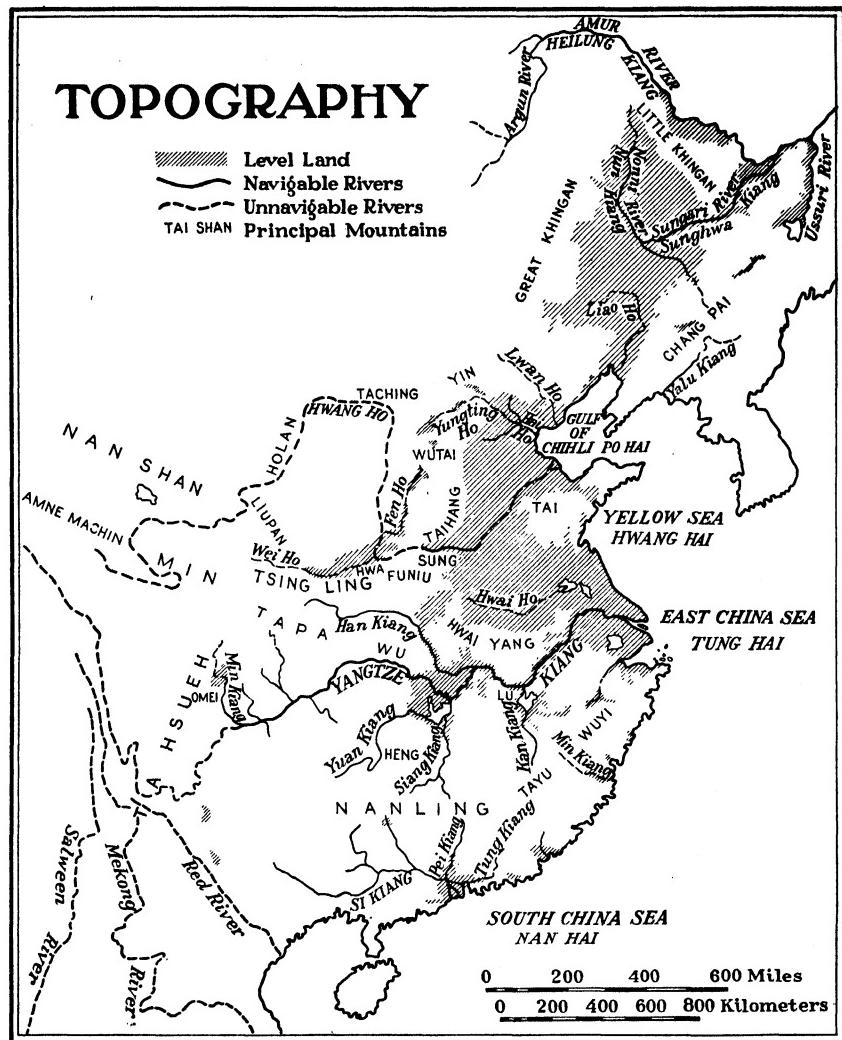


FIG. 21.—Mountains, rivers, and alluvial plains set the stage for the Chinese drama. There are several million square miles where one is rarely out of sight of hills or mountains.

3,000 ft., finally disappearing under the coastal plain in the vicinity of Nanking.

The Tsingling and its associated ranges, later to be described under the Central Mountain Belt, are of particular geographic significance because of the way in which they divide China into the dust-

blown semiarid North and the green humid South. These mountains have long formed an effective barrier to commercial intercourse.

The Nan Shan mark the southern border of westernmost Kansu and do not continue into the central portion of the province beyond Lanchow. Their eastern extent may be represented in the ranges which encircle the Ordos Desert outside the great bend of the Hwang Ho. The first of these is the Holan Shan or Alashan, which are a narrow range reaching a maximum of nearly ten thousand feet. To the north-

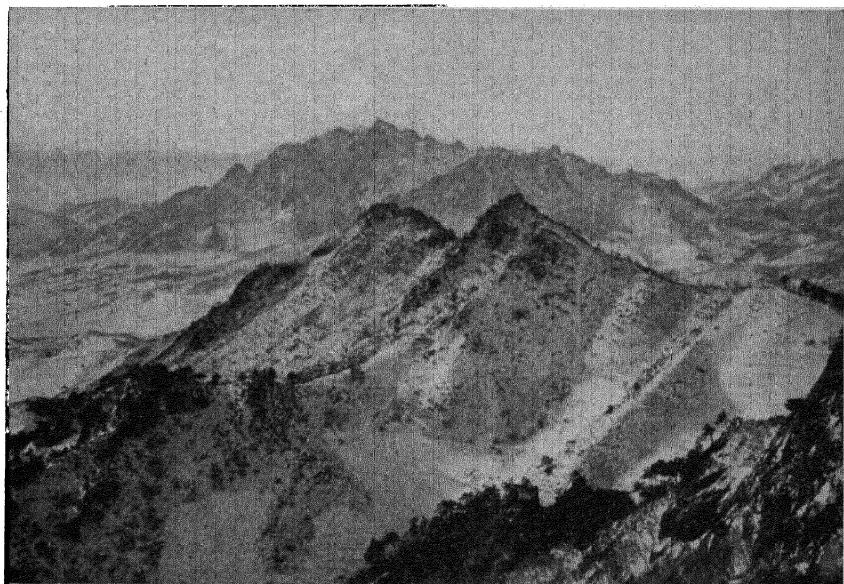


FIG. 22.—The Chien Shan are among the more rugged peaks of southeastern Manchuria.
(*South Manchuria Railway.*)

west of the desert are the Karanarin Ula, and east of it a group of mountains collectively known as the Taching Shan, which themselves do not continue east of Kweihwa. The Taching are but one of a poorly defined series which continue along the borders of Mongolia, following the line of the Great Wall, into Jehol, collectively called the Yin Shan. Topographically, but perhaps not structurally, these mountains turn northeastward along the Mongolian front to form the Great Khingan. The southern part of this range is the upturned and dissected edge of the Mongolian plateau rather than a normal two-sided mountain. Upon approaching the Heilung Kiang, or Amur River, the system turns southeastward and is known as the Little Khingan.

All of China south of the Yangtze is a land of hills and mountains. Only in the far southwest do average elevations rise to a mile, although

a few peaks here and there exceed six thousand feet. In general, there are only clusters of mountainous areas rather than well-defined ranges. The most distinct ranges are those along the northern boundary of Kwangtung and the western frontier of Fukien. The former are the Nanling or Nan Shan, which are crossed by two historic passes, the Meiling and Cheling, which connect Kwangtung with Kiangsi and Hunan, respectively.

Parallel to the coastline of southeastern China is a series of granitic chains, the highest of which serve to mark the boundary between

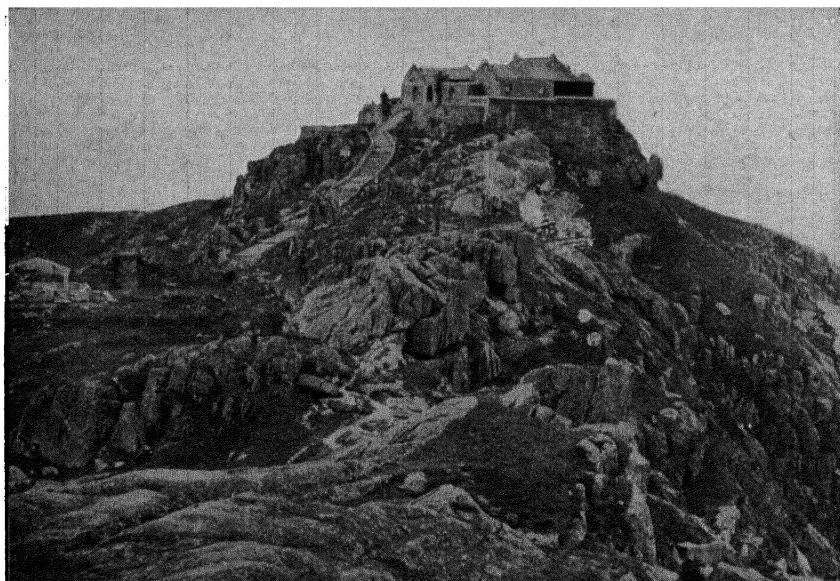


FIG. 23.—Tai Shan in Shantung is probably the most famous of China's sacred mountains. Tens of thousands of pilgrims climb to the temples on its summit each year. (*The Photo Bureau.*)

Fukien and Kiangsi. This range is known as the Tayu Shan in the south and the Wuyi Shan or Bohea Hills in the north. The mountains continue northeastward through Chekiang and form the Chusan Archipelago. Other mountain groups of interest are the Lu Shan near Kiukiang along the Yangtze and the Heng Shan in central Hunan.

Much of the province of Yunnan is a tableland a mile or more above the sea, cut here and there by deep canyons. Eastward in Kweichow the plateau is more thoroughly dissected and little trace remains of the plateau surface. The province of Kwangsi is still

lower. These three areas may be thought of as broken steps leading up to the Tibetan plateaus.

Southeastern Tibet is a maze of mountains with a general north to south trend. Several glacier-clad peaks tower four miles above sea level, with the highest, Minya Gongkar, rising to 7,700 meters. No widely applicable name is available unless it be the Tahsueh Shan, or Great Snow Mountains. Those to the west of the Red Basin of Szechwan are often termed the Szechwan Alps. An outlying peak of importance is Omei Shan.

Two important mountainous areas in eastern China have been omitted in this survey. One is in the peninsula of Shantung where the sacred Tai Shan is the dominating peak. The other is in eastern Manchuria. Along the borders of Korea are a group of mile-high peaks, partially volcanic. The chief ranges are the Tienpao Shan and the Changpai Shan, or Long White Mountains. These mountains continue from the Liaotung Peninsula northeastward to the junction of the Ussuri and Heilung Kiang.

RIVER ARTERIES

Rivers have always played a large rôle in the life of China. With boat or raft or inflated oxhide float, the Chinese have succeeded in utilizing waterways which would be neglected in most Occidental lands. The length of the entire river system of China together with the innumerable canals may aggregate a hundred thousand miles, and a considerable portion of this total is used for navigation in one way or another.

But it is not only the rivers themselves which are significant. Their valleys have been the agricultural lands from which China's millions have been fed, and the confining hills have given to each particular valley the unity and isolation within which distinctive cultures have grown. There is a very real association between certain river valleys and the distribution of social characteristics. Thus the Wei Ho in Shensi was the cradle of early Chinese culture and the Fen Ho in Shansi has afforded security for a group of banking cities. The valley of the Pei Kiang above Canton has long served as the principal avenue to Hankow and central China. So, too, the accessibility of the Yangtze has opened up its watershed, while the area drained by the unnavigable Hwang Ho is still comparatively untouched by foreign influence. The junction of important tributaries is invariably the site of a city, witness Chungking, Luchow, Suifu, and Kiating in the province of Szechwan. Rivers and mountains have been the

positive and negative elements in the topographic framework on which Chinese history has developed.

In the far north, the Heilung Kiang, or Amur River, together with its tributaries the Ussuri in the east and the Argun in the west, forms the boundary of northeastern China for fifteen hundred miles, almost all of which is navigable. Since the native Chinese population in the immediate vicinity of these streams is negligible, the rivers play a small rôle in national affairs. The principal tributary of this system

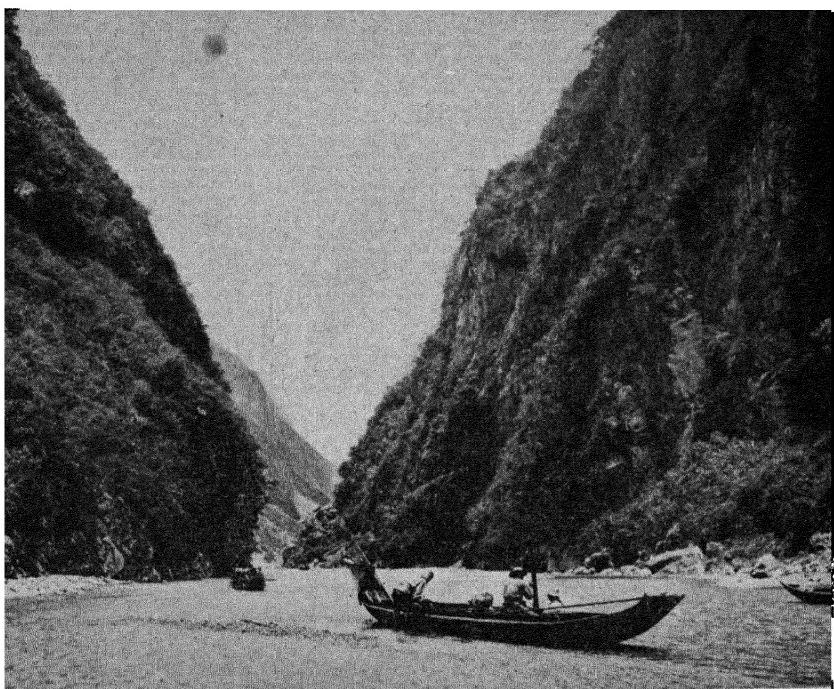


FIG. 24.—The canyon of the Taning Ho in southern Shensi is typical of the mountain gorges which provide the only access to isolated areas. (*Bailey Willis*.)

within China is the Sungari, or Sunghwa Kiang, which is suitable for steamers beyond Harbin and for small boats to the city of Kirin, and as far as Mergen along its own tributary, the Nonni, or Non Kiang. Southern Manchuria is drained by two rivers, the Liao in the center and the Yalu along the borders of Korea. Both are navigable for native craft only.

Between the mouth of the Liao Ho at Yingkow or Newchwang and that of the Hwang Ho, two important streams enter the Gulf of Chihli, known in Chinese as the Po Hai, namely, the Lwan which

drains Jehol and the Hai Ho or Pai Ho on which lies the port of Tientsin. The latter river receives a large number of muddy tributaries which lead back into northern Shansi. Chief of these is the Hun or Yungting Ho. The Grand Canal joins the Hai Ho at Tientsin and is here a canalized river, carrying a considerable drainage from the plain to the south.

The great river of North China is the Hwang Ho, or Yellow River,¹ 2,700 miles in length. Its course eastward from the plateau of Tibet



FIG. 25.—Narrow alluvial plains border the Hwang Ho in western Honan. (W. C. Lowdermilk, courtesy University of Nanking.)

is complex, with several prehistoric changes of channel. Where it enters the province of Kansu, it is a torrential stream some 50 to 75 yd. wide, across which ferry boats maneuver with the greatest difficulty. Through the inverted U-shaped course through the Ordos Desert to the borders of Shansi, flat-bottomed boats and inflated-skin rafts carry a limited commerce, making the downstream trip from Chungwei to Paotowchen in two to three weeks, while the up-river journey requires twice as long. Rapids and waterfalls prohibit navigation

¹ CLAPP, FREDERICK G., The Hwang Ho, Yellow River, *Geographical Review*, XII (1922), 1-18.

KOHLER, GUNTHER, Der Hwang Ho, eine Physiographie, *Petermanns Mitteilungen Ergänzungsheft* 203 (1929). See review by Renner in *Geographical Review*, XX (1930), 160-162.

WONG, W. H., Sediments of the North China Rivers and Their Geological Significance, *Bulletin Geological Society of China*, X (1931), 247-271.

along most of the north to south course between Shansi and Shensi, but below Tungkwan, where the river again turns eastward, native boats can be used. Only in part of Honan and for 25 miles above the mouth is the river navigable for steam launches.

In the last 500 miles of its course, where the river crosses its delta plain, the Hwang Ho does not receive a single tributary. The river is here so choked with sand and silt from the Loess Highlands that it is unable to transport all of its load to the sea and thus deposits its excess burden between the dikes which man is ever raising higher in an effort to control this giant. As a result, the bed of the stream in many places is several yards above the level of the surrounding country. The Hwang Ho is well-known as "China's sorrow," for it has repeatedly shifted its course, entering the sea either north or south of the Shantung Peninsula, and at one time possibly even joining the Yangtze. The two most important tributaries of the Hwang Ho are the Fen Ho, which drains central Shansi, and the historic Wei Ho, which flows eastward across Shensi.

The principal stream between the Hwang Ho and the Yangtze is the Hwai Ho, famous as the river without a mouth. When the Hwang Ho flowed south of Shantung, prior to 1852, it usurped the lower course of the Hwai, and so filled it with debris that the Hwai has not been able to rise to its old channel or to excavate another. At present, the river empties into the Hungtze Hu and other near-by lakes, and the water is prevented from flowing eastward by a dike along the Grand Canal. At times when inflow exceeds evaporation, an enormous area is inundated, with resulting devastation, and some of the water eventually finds its way south to the Yangtze or eastward to the sea.

China's greatest river is the Yangtze Kiang,¹ 3,200 miles in length, sixth longest river in the world, and the most important waterway for navigation in China, draining an area of 756,500 sq. miles. In its upper course through Tibet it is known as the Kinsha Kiang, the river of golden sands. Various names are used by the inhabitants of successive provinces along its banks, while the French refer to it as the Fleuve Bleu, or Blue River. Certainly such a name cannot refer to its color, for it is almost as muddy as the Hwang Ho.

The Yangtze may be divided into three sections, the first of which is the torrential course through eastern Tibet where the valley bottom

¹ CRESSEY, GEORGE B., The Geology of Shanghai, *China Journal*, VIII (1928), 334-345, IX (1928), 89-98.

VON HEIDENSTAM, H., "Report on the Yangtze Estuary," Shanghai: Whangpoo Conservancy Board (1917).

is rarely wider than the river itself. This section of 1,570 miles includes about half the length of the river and has a slope of 9.5 ft. per mile. The seminavigable portion begins at Pingshan near Suifu, 1,630 miles from the sea, and continues through Szechwan and the gorges of western Hupei. The third portion is the thousand miles from Ichang to the sea where navigation is comparatively easy and the depth is from 30 to 100 ft. and over, except for occasional sand bars. Ten-thousand-ton ocean steamships can thus reach Hankow during the summer high-water season, while specially constructed vessels main-

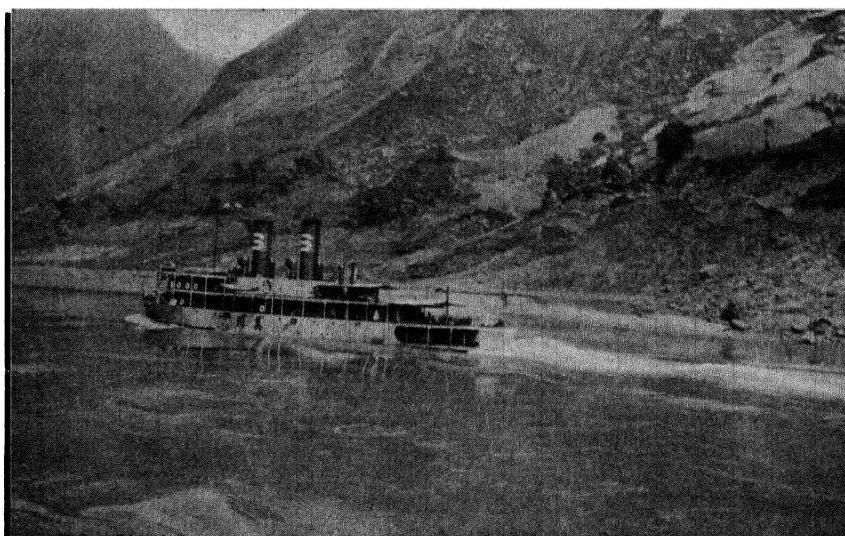


FIG. 26.—Powerful steamers navigate the rapids of the Yangtze. This is a Standard Oil boat bound for Szechwan. (*China International Famine Relief Commission.*)

tain a year-round service to Chungking. From Wuhu to the sea, the slope is but 1:100,000. Both the mean annual discharge of 1,047,500 cu. ft. per second (Wuhu) and the maximum recorded discharge of 2,800,000 cu. ft. per second (Hankow, 1931) are apparently the highest of any river in the world.

(Numerous tributaries join the Yangtze, among them being the streams of the Poyang and Tungting Lakes in Kiangsi and Hunan, especially the Siang and Yuan which enter the latter lake. The Han Kiang, from which Hankow derives its name, is probably the most important tributary. The Kialing Kiang, Lu Ho, and Min Kiang in Szechwan are each important. All of these streams are navigable for native craft.

Between Shanghai and Canton, three important rivers break through the mountains to the sea, each with a delta city at its mouth. Hangchow has the Chientang, Foochow the Min, and Swatow the Han. These streams are not navigable in any ordinary sense of the word, although industrious boatmen carry on a considerable traffic.

The Canton delta is the focal point for three river systems, none of which actually pass the city which lies on the Chu Kiang, or Pearl River. These rivers are the Tung Kiang, or East River, the Pei Kiang, or North River, and the Si Kiang, or West River. Only the last is easily navigable, with steamers reaching Wuchow within the borders of Kwangsi and beyond.

The province of Yunnan in the far southwest is drained by the upper courses of the Red River of the South, the Mekang and the Salween, each of which reach the sea outside Chinese territory and in their course through China flow through deep gorges. The remaining Chinese river of importance is the Tarim, which flows through the Taklamakan Desert in Sinkiang into the salt lake of Lop Nor.

ALLUVIAL PLAINS

Level plains characterize the Chinese landscape only in a few areas, chiefly in the north. The largest of these is the compound delta which reaches from central China northward into Manchuria. It begins near Ningpo in Chekiang and continues westward past the Chientang Kiang to Hangchow, thence northward across the Yangtze Plain and the lower Hwai Valley to the vast alluvial area of the Hwang Ho both north and south of Shantung. To the north this flat area merges with the deposits of the streams which focus on the Hai Ho at Tientsin and eastward joins the delta of the Lwan Ho. From Shankaikwan into the Liao Valley the coastal plain is narrow but essentially continuous. In Manchuria there is a considerable extent of alluvial land near the mouth of the Liao around Yingkow and the plain finally ends against the mountains of Liaotung, some seven hundred fifty miles north of Ningpo.

Central Manchuria is a rolling lowland, drained by the southward-flowing Liao and the northeastward-flowing Sungari. Most of the area is an erosional rather than a depositional surface, but it is covered with a deep soil.

The largest and most densely populated section of this level land is the delta plain of the Hwang, Hwai, and Hai in Honan, Shantung, Hopei, northern Anhwei, and northern Kiangsu. This geographic region is known as the North China Plain and forms the home of eighty million people and is the center of China's ancient culture.

Two large inland basins dominate the valley of the middle Yangtze, each known by the lake which partially occupies the area. In Kiangsi there is the Poyang Hu and in Hunan the Tungting Hu. These lakes serve as natural reservoirs and sediment basins for the summer flood waters of the Yangtze. During the low-water season the lakes greatly decrease in size, and so much silt has now accumulated that their basins are rapidly decreasing in area.

Alluvial areas south of the Yangtze Valley are few and scattered. Small deltas are found around Swatow and Canton, through which unburied islands project as isolated hills. Elsewhere level land is restricted to isolated flood plains. West China has limited flat areas in the plateau of Yunnan and the alluvial fan around Chengtu.

Large areas of level or rolling country are found in Mongolia and smaller tracts in Tibet. Since both the mode of origin and the agricultural significance of these areas are so different from those just discussed, they may be omitted for the present.

THE FRINGING SEA

The sea has never played a large rôle in the activities of the continent-minded Chinese. The coast line has an aggregate length, omitting minor indentations, of over three thousand miles. About a third of this is along the low-lying delta plain from Ningpo to Yingkow where sand banks fringe the coast and harbors are few. Large vessels with cargo for Tientsin, for example, have to discharge their freight outside Taku Bar almost out of sight of land. Even Shanghai is handicapped by shallow water in the estuary of the Yangtze. The rocky peninsulas of Shantung and Liaotung afford the best harbors in North China, with Tsingtao, Chefoo, and Darien as the chief ports. Haichow in northern Kiangsu, Chinwangtao in northeastern Hopei, and Hulutao in southwestern Liaoning are examples of partially developed harbors made possible by rocky hills which border the sea. Because of the combination of extensive agricultural plains and difficult access to the sea, the people of the northern provinces have not been particularly interested in fishing or in maritime trade.

South of the Chusan Archipelago, which lies just outside Ningpo, the topographic situation is quite different, with a corresponding contrast in human response. Level land is at a high premium and the drowned coast line affords innumerable harbors. Kwangtung, Fukien, and southern Chekiang very definitely face the sea. Overland travel is difficult and most of the contact with the remainder of China is by water. Even here, however, it is only along the coastal fringe that maritime interests dominate over agriculture. Timber is fairly plentiful

and each river port has its characteristic type of fishing boat. This is the home of picturesque seagoing junks, some of which go as far as the East Indies, as well as north to Tientsin, carrying cargos of dried fish or lumber.

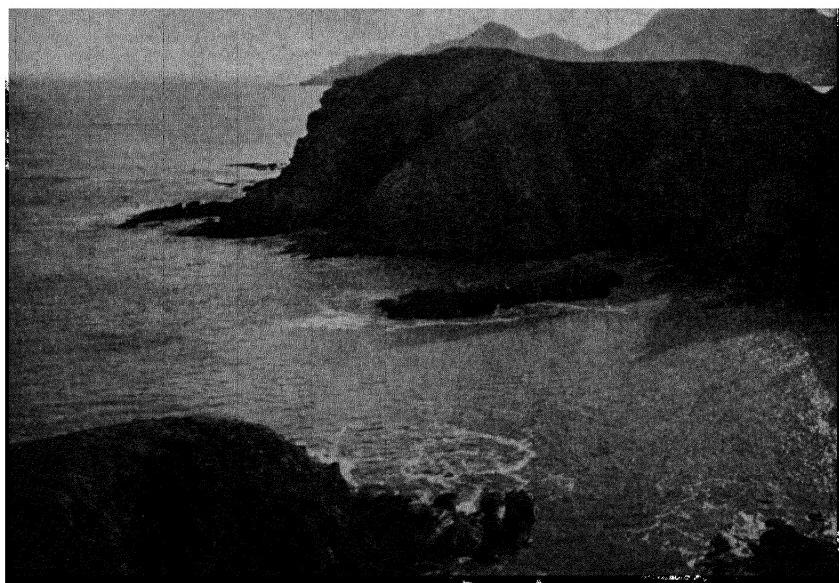


FIG. 27.—The rocky promontory of Shantung. (*Atto Photographic Association.*)

THE CHANGING MAP OF CHINA

The political geography of present-day China contains numerous instances of the adjustment between land forms and civil authority. If historical details were available, it would doubtless appear that there have been many more shifts in boundaries within level areas than where mountain ranges make communications and economic unity more difficult. Nowhere except in some of the newer hsien in Heilung-kiang are political boundaries laid out along arbitrary lines of latitude or longitude. Only in a few instances do provincial limits coincide with major rivers. To a remarkable extent, however, political lines follow the crests of mountains or the divides between drainage areas. In other cases the boundary may roughly coincide with the limits of agricultural land, as along the desert.

The international boundaries of China have never remained fixed for more than a few centuries. At times Chinese dynasties such as the

Han have extended their rule to Western Asia, while the domain of Kublai Khan reached from Indo-China almost to the shores of the Baltic. At other periods China has been split up into a series of smaller kingdoms. The Great Wall has only occasionally marked the political frontier of China. Manchuria, especially the southern half, has formed an integral part of China off and on since the earliest times.

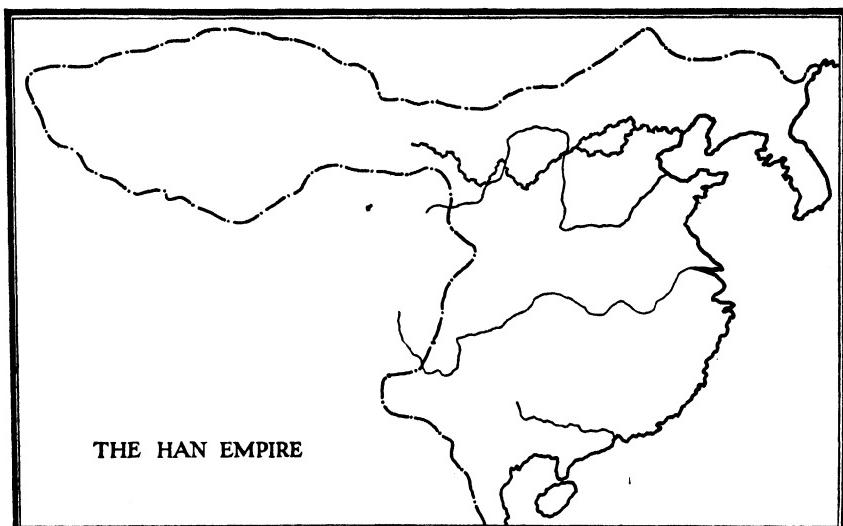


FIG. 28.—The Han Empire, 206 B.C. to 220 A.D., extended far into Central Asia as well as into Manchuria and Korea. (*After Shigeno and Kawada.*)

In an authoritative Japanese historical atlas entitled "The Changed Boundary Lines of China"¹ there are nineteen maps beginning with 2200 B.C. Of these, three of the last four show all of Manchuria as belonging to China. Taking the atlas as a whole, Manchuria is entirely within China on three, a large part is Chinese on nine, a small part on five, and not at all on two maps. Sinkiang or Chinese Turkestan has also usually belonged to China, although the ties have frequently been insecure on account of its remote position. The major portions of Mongolia and Tibet have usually been independent of political control by purely Chinese dynasties, although the cultural influence has been important. It should therefore be clear that there is no established area to be known as *China proper*.

During recent centuries, China has traditionally consisted of eighteen provinces lying south of the Great Wall, together with the

¹ SHIGENO, Y., and KAWADA, S., Tokyo (1896).

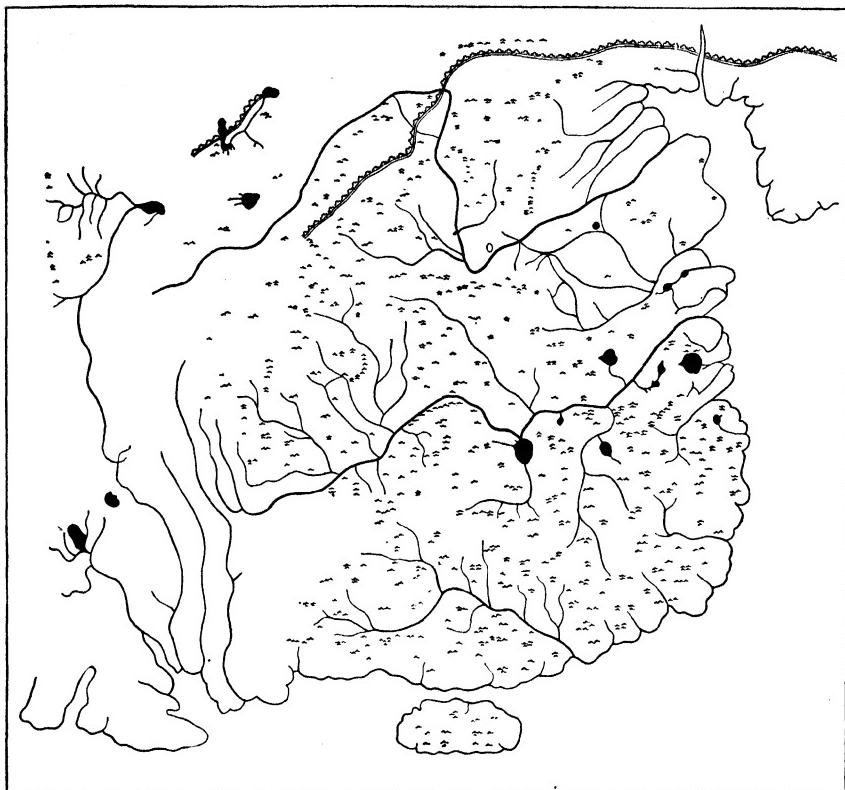


FIG. 29.—The oldest known map of China. The original is about 30 in. square and contains numerous place names not shown above. It was carved on a stone tablet at Sian about 1137 A.D. and is based on maps from the ninth and third centuries. The westernmost location is Kashgar.

outer territories of Manchuria, Mongolia, Chinese Turkestan, and Tibet.¹ Even these provinces have had a changing history, for during the nineteenth century several pairs of them were united, as, for instance, Shensi and Kansu, which were known as Shenkan, and Kwangtung and Kwangsi, known as Liangkwang. This traditional alignment no longer holds and there are now twenty-eight provinces and the two territories of Outer Mongolia and Farther Tibet.

In Table II (p. 55) figures are presented for area and population of the twenty-eight provinces. Areas have been derived from planimeter measurements on a new map with a scale of 1:5,000,000 which formed

¹ Some of the following material is taken from an article by the author entitled *The New Map of China*, *Geographical Review*, XX (1930), 652-656.

the basis of the map in the back of the book. Averages of five readings were taken in each instance. These figures differ slightly from those given in various handbooks, which have been copied from obscure sources and which apply, in some instances, to old boundaries. According to the "Encyclopedia Britannica," Greater China has an area of 4,277,260 sq. miles. Population statistics of the Post Office are published by hsien arranged according to postal districts. They have been here recomputed by provinces.

The land of the Manchus has been divided into three provinces since 1903, known as Heilungkiang, Kirin, and Fengtien. Fengtien province has also been called Shengking but in 1928 was renamed Liaoning. Many old maps of Manchuria show a considerable area east of the Khingan Mountains labeled the Eastern Gobi and belonging to Mongolia. This region is not a desert and has little in common with real Mongolia. For many years it has formed a part of Liaoning. The province of Heilungkiang extends west of the Khingan Mountains into geographical Mongolia, here known as Barga. Japanese activities since 1931 have altered the political situation, producing results which it is too early to evaluate.

The status of Mongolia is complicated, for it was rather loosely connected with China during the Manchu dynasty. The portion lying next to the Great Wall and south of the Gobi Desert is known as Inner Mongolia. After the Revolution of 1911 this section was divided into five parts. The easternmost area, lying really in Manchuria, was assigned to Liaoning, while the remainder was divided into the special administrative districts of Jehol, Chahar, Suiyuan, and Sitao. These special administrative districts also included the territory north of the Great Wall shown on some maps as belonging to Chihli and Shansi. Upon the establishment of the Nationalist Government in 1928, these districts were raised to the status of full provinces. The area of Sitao was enlarged by the transfer of Ningsia tao (a tao being a group of hsien, or counties), formerly in Kansu, and the name of the newly created province was changed to Ningsia. Five hsien formerly in Chahar were transferred to Suiyuan, and all of north-western Chihli outside the Nankow branch of the Great Wall was added to Chahar.

The remainder of Mongolia, lying next to the Siberian border and comprising most of the Gobi, is known as Outer Mongolia. There are no legally defined boundaries in Mongolia, and the lines shown on various maps merely refer to the traditional limits of tribal grazing grounds. The recent history of this region has been a checkered one, with China and the Soviet Union both striving for mastery. After



FIG. 30.—The twenty-eight provinces of China. Boundary changes are shown in broken lines. (Courtesy of the *Geographical Review* published by the American Geographical Society of New York.)

THE CHANGING MAP OF CHINA

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TABLE II.—POPULATION AND AREA OF THE PROVINCES OF CHINA

Province	Capital	Population, Post Office estimate, 1926	Area	
			Square kilometers	Square miles
Anhwei.....	Anking	20,198,840	148,806	57,439
Chahar.....	Changchiakow (Kalgan)	2,166,196	262,891	101,476
Chekiang.....	Hangchow	24,139,766	94,488	36,472
Chinghai (Koko Nor)	Sining	795,072*	411,683	158,910†
Fukien.....	Foochow	14,329,594	120,503	46,514
Heilungkiang.....	Tsitsihar	4,632,074	568,068	219,274
Honan.....	Kaifeng	35,289,752	165,398	63,843
Hopei (Chihli).....	Peiping (Peking)	29,945,786	145,978	56,116
Hunan.....	Changsha	40,529,988	217,412	83,921
Hupei	Wuchang	28,616,576	184,544	71,234
Jehol.....	Chengtel (Jehol)	4,517,661	186,549	72,008
Kansu.....	Lanchow	5,815,680	414,397	159,934
Kiangsi.....	Nanchang	27,563,410	174,352	67,300
Kiangsu.....	Chinkiang	34,624,433	101,296	39,100
Kirin.....	Kirin	5,633,186	272,030	105,003
Kwangsi.....	Nanning	12,258,335	209,771	80,972
Kwangtung.....	Canton	36,773,502	233,801	90,247
Kweichow.....	Kweiyang	11,291,261	186,679	72,058
Liaoning (Fengtien) ..	Mukden (Fengtien)	13,775,559	259,704	100,246
Ningsia (Sitao).....	Ningsia	812,066*	292,308	112,831
Shansi.....	Taiyuan	12,005,735	171,672	66,265
Shantung.....	Tsinan	34,375,849	149,873	57,851
Shensi.....	Sianfu	17,222,371	197,880	76,382
Sikang (Chwanpien) ..	Tatsienlu	Not obtainable	346,061	133,579†
Sinkiang (Chinese Turkestan).....	Tihwa (Urumtsi)		1,425,999	550,579†
Suiyuan.....	Kweihwa-Suiyuan	2,423,344	249,710	113,758
Szechwan.....	Chengtu	52,063,606	405,893	156,675
Yunnan.....	Yunnanfu	11,020,591	388,028	147,849
Total.....	.....	485,508,838	8,025,114	3,097,836

* Incomplete data, dealing only with the parts formerly in Kansu.

† "China Year Book" (1932).

‡ With arbitrary limit for western boundary at edge of map.

the Chinese Revolution of 1911, Mongolia proclaimed her independence and set up her own government. A year later Russia pledged her assistance in maintaining an autonomous régime, and in 1913 China agreed to this autonomy. Russia at the same time recognized China's basic suzerainty over Outer Mongolia. This status was confirmed in a tripartite agreement in 1915 between China, Mongolia, and Russia; and Chinese citizens in Mongolia were granted extra-

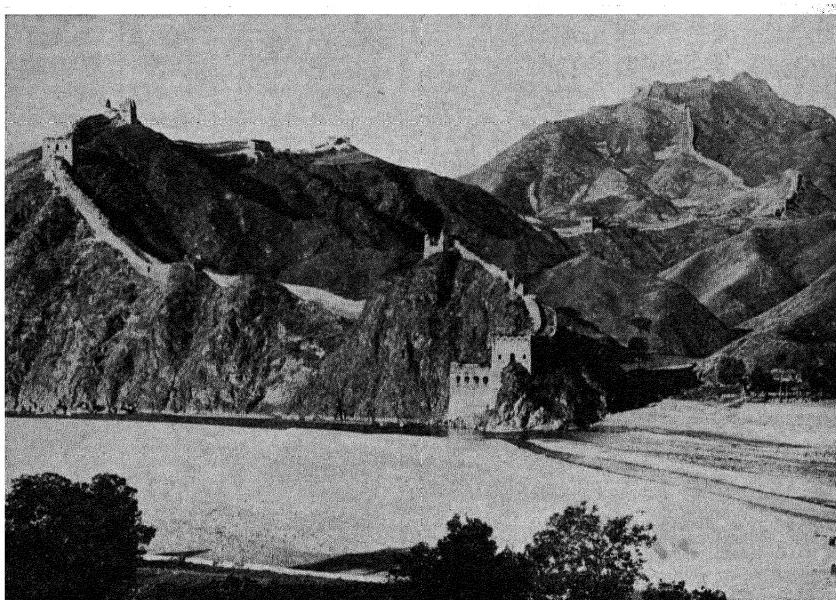


FIG. 31.—The Great Wall is the supreme monument to the engineering courage of ancient China. This view is at Kupeikow, northeast of Peiping. (*Ato Photographic Association.*)

territorial privileges. During the Russian Revolution, Mongolia was invaded first by Chinese, then by White Russian, and later by Red Russian armies. In the Sino-Soviet Treaty of May, 1924, it was recognized that Mongolia is an integral part of the Republic of China, although Russia's special interests were acknowledged. Outer Mongolia was not a party to this agreement and in November, 1924, adopted a constitution which declares the country to be an independent soviet republic. There is no Chinese control at the present time, and for all practical purposes Outer Mongolia is a protectorate of the Soviet Union.

The vast territory of Chinese Turkestan was given the rank of a province in 1878 and is more properly known by its Chinese name of

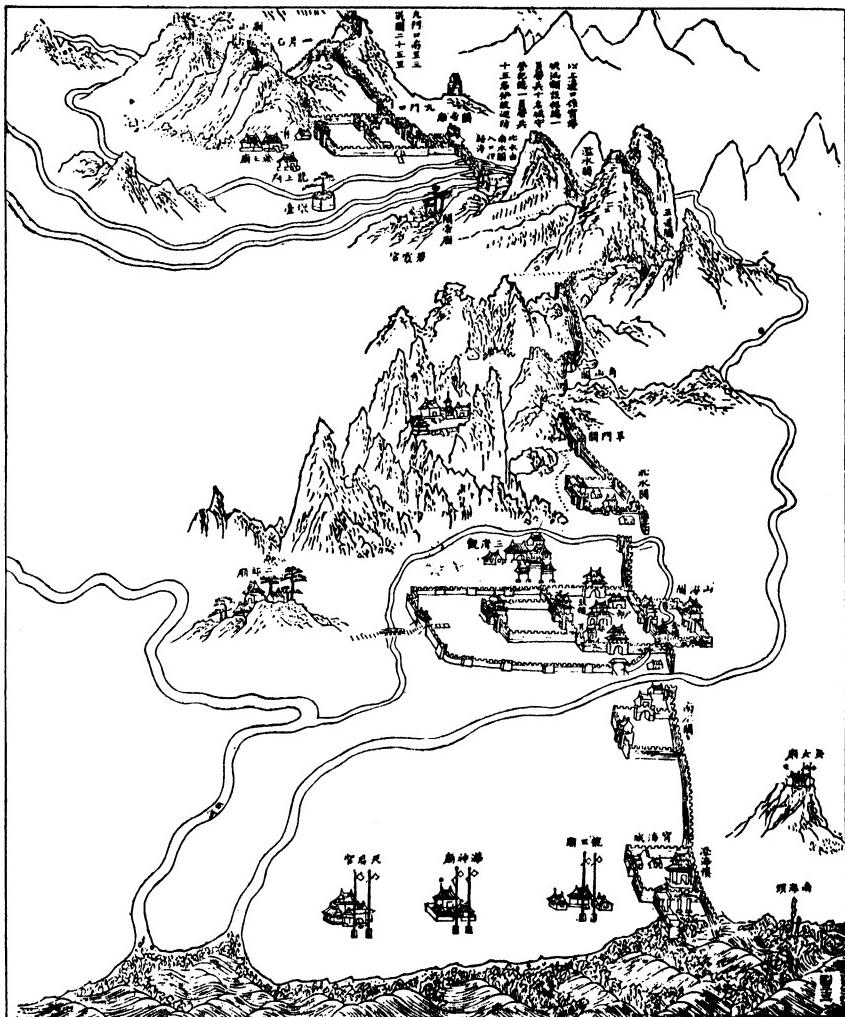


FIG. 32.—A topographic map of the vicinity of Shanhaikwan, where the Great Wall crosses the narrow plain between the mountains and the sea. The distance from Shanhaikwan (center) to the sea (foreground) is about five miles. (*Courtesy Harvard Yenching Institute.*)

Sinkiang. Owing to its remote location (the normal caravan journey from Peiping to Kashgar requires about 125 days), the political control has been loosely administered, but it has nevertheless been customary to exchange telegraphic confirmation of appointments. Russian influence has long been important in Sinkiang, and the completion

of the new Turk-Sib Railway east of Lake Balkash will doubtless tend to weaken Chinese control.

Chinese jurisdiction over Tibet dates from the early days of the Manchu dynasty, although there were occasional contacts before that time. A treaty between China and England in 1906 recognized China's suzerainty and was followed by another treaty the next year between England and Russia which confirmed China's authority. Tibet did not willingly accept this situation, and during the Revolution of 1911 in China the Chinese amban at Lhassa was killed and all Chinese driven out of Tibet. In 1914 a treaty was drawn up between China, Tibet, and England which was initialed but never signed by China. England and Tibet proceeded to sign, but the present status of the treaty is undecided. Under this convention Tibet was divided into two sections, Nearer and Farther Tibet, so named on account of their position with respect to the provinces of China. The whole of Tibet was recognized as being under China's suzerainty; but Farther Tibet, which includes Lhassa and most of the plateau, was to be more or less autonomous. During recent years China has exercised little jurisdiction west of the Yangtze.

Nearer Tibet comprises the mountainous borderland next to the old limits of China. This region consists of two parts, for several years classed as special administrative districts but in 1928 reorganized as provinces. That to the south lies largely in what was formerly western Szechwan and is known as Sikang or Chwanpien. The northern province is Chinghai (Post Office spelling, Tsinghai) or Koko Nor and includes Sining tao which formerly was a part of Kansu. As is the case along the northern borders of the new tier of provinces in Inner Mongolia, the western limits of these new Tibetan provinces are vague and the actual boundary fluctuates with the varying strength of the local military authorities.

In addition to these new provinces there have been changes in the older areas. After the Nationalist advance to North China, the province of Chihli was renamed Hopei. Chihli means "direct rule" (from the throne), while Hopei means "north of the (Yellow) river." The northern boundary of Shensi is shown on most maps as coinciding with the Great Wall, but such is not the case. Maps of the Chinese Military Staff place the boundary some distance outside the Wall to include the strip of territory that is tributary to the towns along the line of the Wall.

Numerous changes have also been made in city names. This is a frequent occurrence in China, and there are few places which have not had three or four names during their history. Most important

of these is the change from Peking, meaning "northern capital," to Peiping, which means "northern peace." This is the name borne by the city for a time prior to 1416 when the Ming dynasty was located in Nanking.

In comparing various maps, it is well to bear in mind the many variations in the romanization of Chinese names. Thus even a city like Shanghai is variously spelled Changhai, Tchanghae, and even Szangaj, the last being the Polish version.

CHAPTER III

CLIMATE, THE KEY TO HUMAN ACTIVITIES

THE MECHANICS OF CHINA'S CLIMATE

China's succession of passing weather is the product of the seasonal monsoon circulation, the occasional tropical cyclones, and the procession of continental cyclonic storms, which in turn are modified by topography and relation to the sea. The long-time average of these varying conditions is the climate, about which we may read in books, but it is well to remember that people live in a world of day to day weather. In a land where agriculture is so significant, human welfare is intimately associated with favorable conditions of rain and temperature. This is especially true in large parts of the North where the average precipitation is but 20 in. and any slight decrease or irregularity as to time is sure to bring acute distress.

The position of China in Southeastern Asia is the basic factor in determining its climatic *régime*. In these middle latitudes, the general drift of the atmosphere is from the west. Lying on the east coast of the continent, China's weather is dominated more by imported conditions from inner Asia than by the near-by Pacific. There are thus marked contrasts between conditions in China and those in similar latitudes in Europe where maritime influences prevail.

Eurasia is the largest of the continents, and its interior is one of the driest areas on earth. Coupled with this marked aridity are extreme ranges of heat and cold, for parched deserts do not have the stability in temperature which characterizes water bodies. Thus Mongolia and Siberia are much colder than the surrounding oceans in winter and warmer in summer. During the summer months, the air over interior Asia becomes heated and expands. This causes it to rise and overflow aloft toward the encircling oceans where the added air raises the barometric load. The reduced pressure over the interior resulting from this outflow causes warm moist oceanic air to be drawn in along the surface to make up the deficiency. This process establishes a large-scale convectional circulation with a semipermanent low pressure over the land and semipermanent high pressure over the oceans. During the winter, conditions are reversed with cold, dry, descending and outblowing air over the continent and rising air over the oceans.

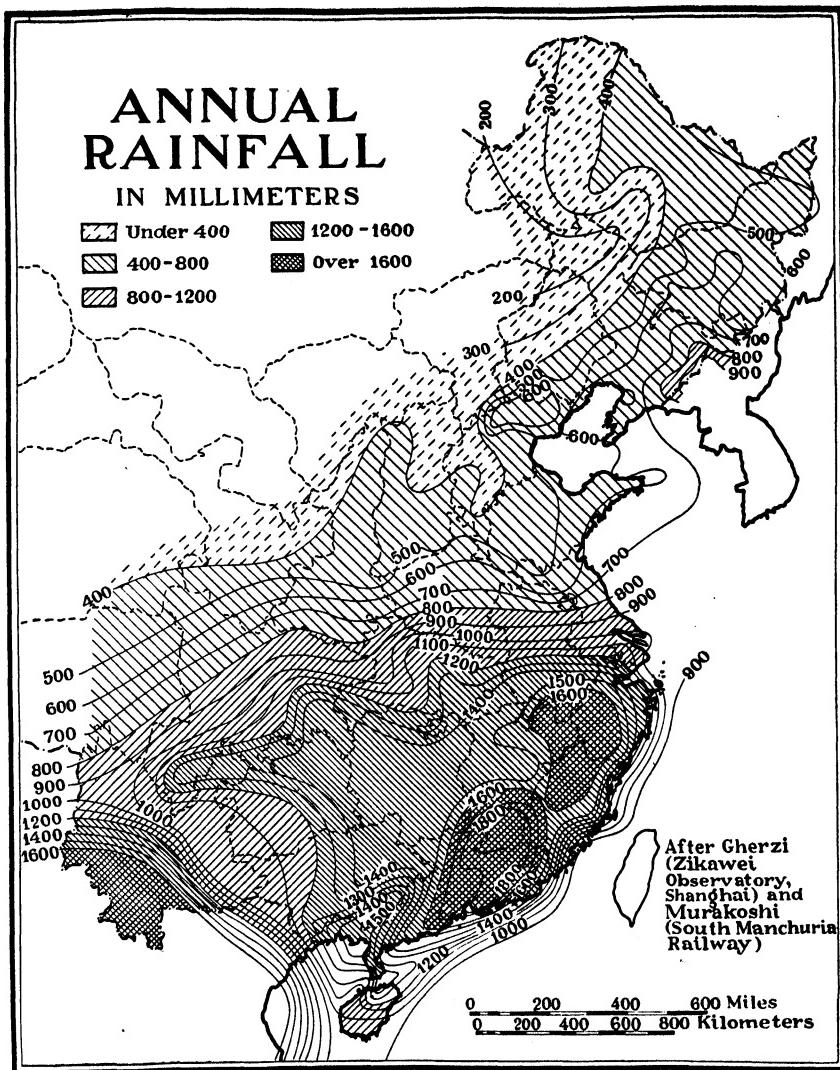


FIG. 33.—The annual distribution of rainfall.

The Siberian winter anticyclone has the highest recorded pressures known, occasionally reaching 810 mm. (32 in.).

No continent exhibits this circulatory system so strongly as Asia, and it is of far-reaching importance in the climate of China. In India these seasonal to and fro shifts of the wind are especially regular and are known as the monsoons. They operate with less

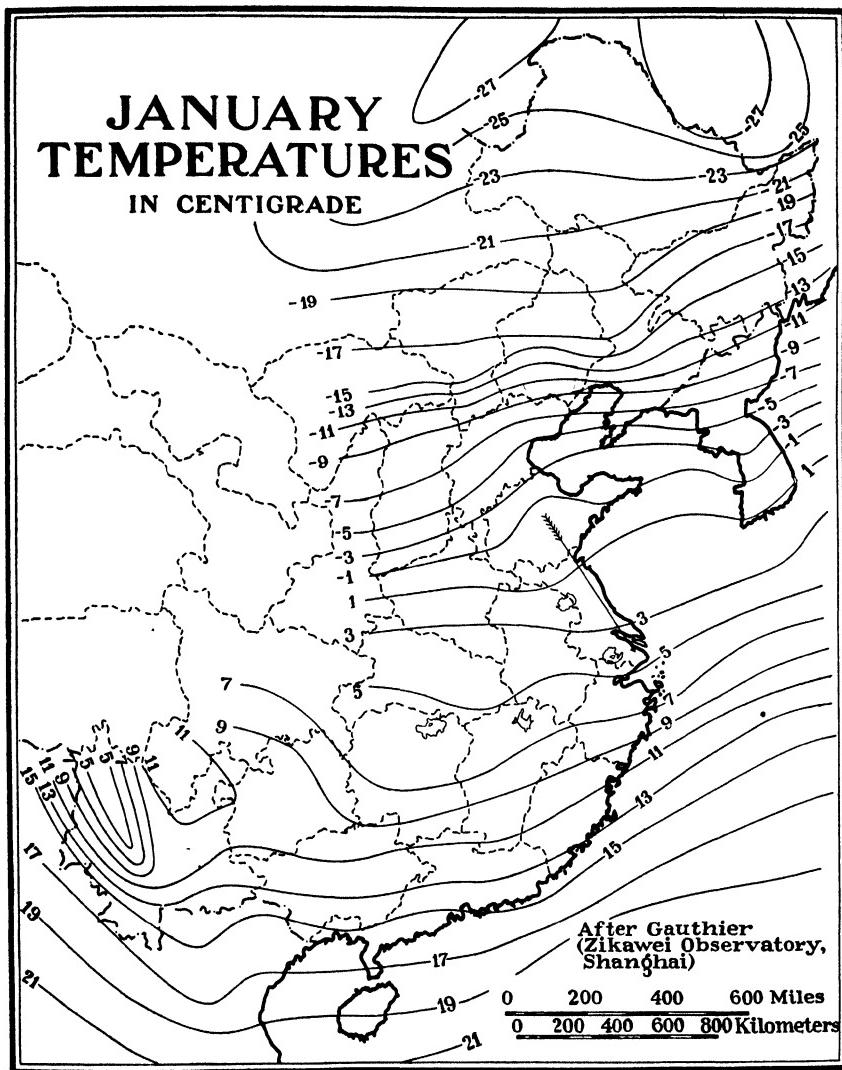


FIG. 34.—Average day and night temperatures in January. The direction of the wind at Shanghai is indicated by the arrow.

dependability in China and form a general background rather than a strict climatic control. It is probable that some writers have over-emphasized the dominance of the monsoon in China, for it is only one of several factors.

In almost all sections of the country the wind blows from every point of the compass during each month and almost each week, so

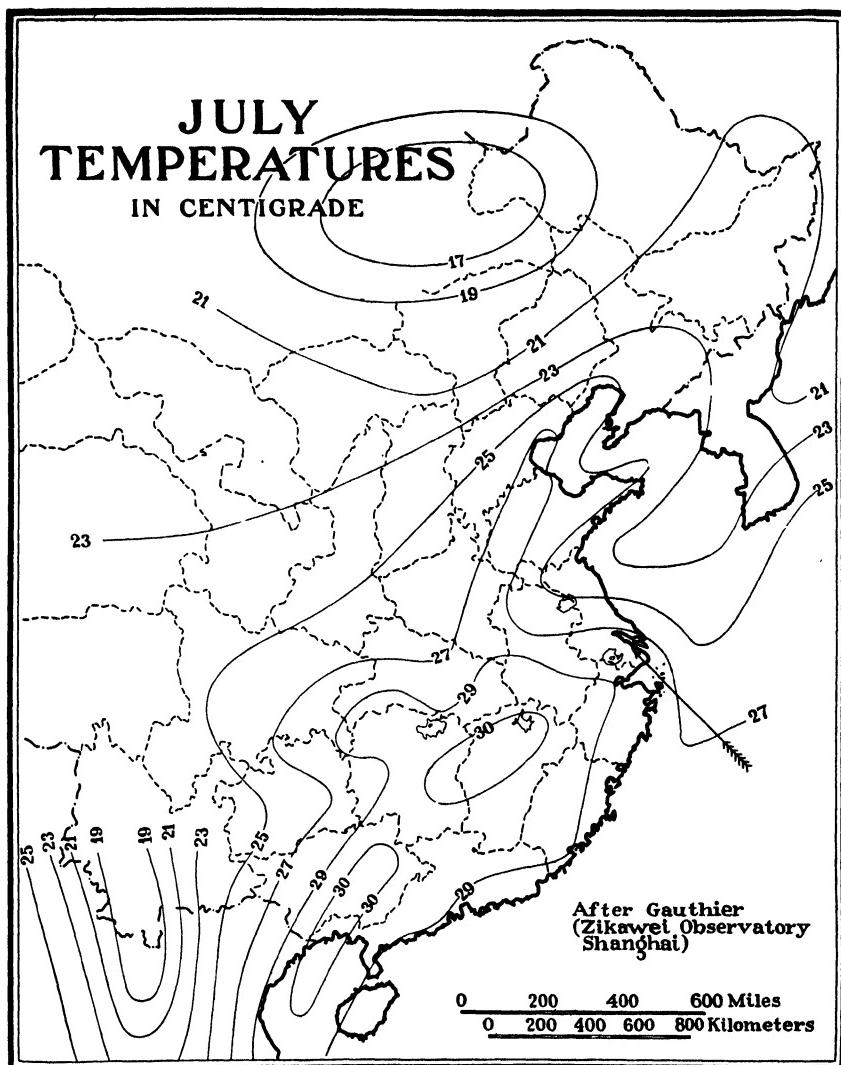


FIG. 95.—Average day and night temperatures in July. The direction of the wind at Shanghai is indicated by the arrow.

that only in statistical averages does the tendency appear for southerly oceanic winds to blow in summer, with northerly continental winds in winter. Generally speaking, the averages indicate prevailing winds in winter from the northwest in northern China, north in central China, and northeast in southern China. In summer, the prevailing winds all over China are southerly or southeasterly. From the results

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of daily pilot-balloon flights made at Nanking during 1930 and 1931, it is apparent that neither the northeastern monsoon in winter nor the southeastern monsoon in summer extends higher than 1,500 meters, while above that altitude westerly winds prevail throughout the year.¹

From October to March a semipermanent anticyclonic area covers Lake Baikal and the neighboring parts of Siberia with an average pressure of at least 770 mm. The isobars, or lines of equal pressure, which encircle this center spread with a regular gradient across most of the continent toward barometric minima over the surrounding oceans. The winds thus blow outward from Siberia with a diverging path and a clockwise direction; and are both cold and dry. From May through August the situation is reversed with a semi-permanent low pressure area in interior Asia and relatively high pressure over the Indian and Pacific Oceans, resulting in inblowing counterclockwise winds which carry warmth and moisture to the continent.

During January the average temperature at Aigun in northern Heilungkiang is $-25.5^{\circ}\text{C}.$, while at Lamko in the island of Hainan it is 18.6°C . There is thus a difference of 44°C . (79°F .) between latitudes 50° N. and 20° . No country in the world shows a greater contrast between its northern and southern borders than this. In July, however, Aigun has an average of 20.8°C . and Lamko is 28.5° , a contrast of only 7.7° .

Superimposed on this seasonal monsoon tendency are a series of traveling disturbances known as cyclonic and anticyclonic storms. These are smaller areas of low or high pressure, respectively, about which the winds whirl in a rotary fashion, moving inward with a counterclockwise course in cyclones and outward with clockwise direction in the case of anticyclones. These storms are similar to the familiar lows and highs which cross North America and Europe on the average of once a week, though usually smaller and less intense. Their origins are obscure but may be associated with the eddies or disturbances produced by the meeting of southward-moving polar air and northward-moving tropical air masses.

Cyclonic storms are well-known in the Occident and form the basis of daily weather forecasts. Only recently have their characteristics been understood in Asia. This is partially due to the limited number of weather stations in the interior. Just where the cyclonic storms of China originate is unknown. Most of them first appear in the middle portions of the Yangtze and Hwang Ho not far from the edges of Tibet. They move eastward and cross Japan into the Pacific. Some

¹ *Bulletin of the Upper Air Current Observations*, Nanking: National Research Institute of Meteorology, I (1930); II (1931).

probably come across Asia from Europe, being unreported *en route* owing to the absence of meteorological stations. Others may originate along the eastern margins of the Tibetan plateau. Whatever their origin, it is probable that many of these Chinese storms cross the Pacific via the Aleutian Islands and later appear in North America. An understanding of their characteristics may thus eventually furnish a basis for forecasting weather changes a week or two later in the United States.

As low-pressure areas move eastward over China, they draw in moist tropical air in their southeastern quadrant and attract cold Siberian air in their rear. During the summer when there is a tendency for the southern monsoon to predominate, the two forces join hands so that large quantities of warm humid air are imported from the Pacific, thus making the front of the cyclonic storm the more active area. During winter months, on the other hand, the continental monsoon air reenforces the normal northerly winds which characterize the back of the disturbance, bringing a cold wave with high winds.

While some rainfall is associated with northward-moving tropical air masses, the southward-flowing Siberian air appears to be the more important dynamic agent in China at all seasons, especially during the winter. Cold air is heavy and hugs the surface; its advancing cold front is a thin wedge which underruns the lighter warm and moist air, forcing the latter to rise along an inclined plane of contact. Thus lifted, the warm air expands and is cooled and on becoming saturated precipitates its moisture.

The cyclones of China have an average diameter along the major axis of 1,460 km. (905 miles) and are thus considerably smaller than those of the United States whose corresponding dimensions are 2,500 km. (1,550 miles). Although their individual extent is limited, they follow different paths, so that almost all of China feels their effect at one time or another. (The average speed of their center is 39 km. (24 miles) per hour, which is intermediate between the rates for Europe and the United States. In some instances these storms remain stationary for days, while at other times they progress at more than four times the above-mentioned average. These figures refer, of course, to the movement of the disturbance as a whole, rather than to wind velocities.

One of the first students of these storms was Father Froc¹ of Zikawei Observatory at Shanghai. This Jesuit station has long been a center of meteorological study and has rendered an inestimable service in issuing storm warnings to coastwise ships. Froc traced

¹ Froc, L., "L'atmosphère en Extrême-Orient," Paris, Imprimerie Nationale (1921)

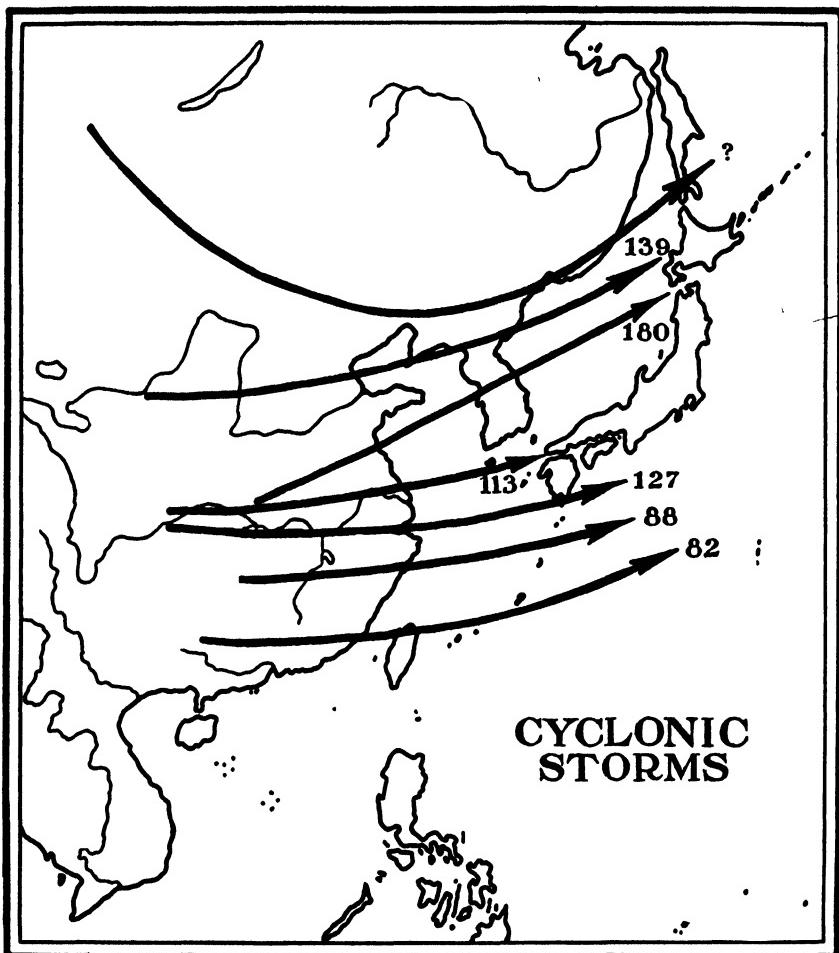


FIG. 96.—The average paths of continental cyclonic storms from 1893 to 1924. (After E. Gherzi, Zikawei.)

1,264 cyclonic storms between 1893 and 1918 and grouped them into four classes, according to their position where they entered the sea. His work has been continued by Father Gherzi. The most recent analysis is that of Sung Shio-wang¹ of the newly formed National Research Institute of Meteorology at Nanking. By using the weather maps of Zikawei he has followed 841 cyclones from 1921 to 1930, or an average of 84.1 per year. This is almost double the average obtained by Froc and is due to the inclusion of all extratropical disturbances

¹ SUNG SHIO-WANG, "The Extratropical Cyclones of Eastern China and Their Characteristics."

which have a converging-wind system, whether along the coast or in the interior.

The cyclonic storms of China have been grouped by Sung into six types according to their paths. One appears from Siberia and moves southeastward across southern Manchuria. Many of these storms are known to come from Europe. Two North China types first appear in the vicinity of the Ordos Desert and move either eastward across southern Manchuria or southward to the mouth of the Yangtze. Three types pass out along the Yangtze Valley. The more important of these traverse the provinces just south of the river eastward from Kweichow and Hunan. Two other types are known as the Eastern Sea and Northeastern types from their place of occurrence. The numerical importance of lows along these various paths from 1921 to 1930 is as follows: Siberian type, 181; North China types, 265; Yangtze types, 277; Eastern Sea type, 71; and Northeastern type, 47. This distribution agrees in general with that of Gherzi.

The third element in the climate of China is the tropical typhoon, similar to the hurricanes of the West Indies. These are small but very intense disturbances with exceptionally low pressure in their centers, steep barometric gradients, and wind velocities up to 145 miles per hour. The disturbance as a whole may move a few hundred miles a day. Diameters vary, but the area covered by intense activity may extend but a few tens of miles from the center. While the more destructive effects are confined to a narrow path, the general circulation of the atmosphere may be modified for hundreds of miles, with results somewhat similar to those during a cyclonic storm. The most severe typhoon action is usually over the open sea and a narrow strip of adjoining land. After entering the continent they quickly lose their vigor.

The typhoons of the western Pacific originate east of the Philippine Islands in the vicinity of the Marshall and Caroline groups and move west and then northeast, either striking the southeastern coast of China or recurring toward Japan before reaching the mainland. When, as occasionally happens, they recurve after entering the continent, they travel twice as fast as when moving westward, and after reaching the ocean their intensity is greatly increased. Since these storms follow more or less regular paths, it is often possible to predict something of their movement and issue appropriate warnings to shipping. Gherzi has mapped 263 typhoons which have entered China from 1893 to 1924, or an average of 8.5 per year.

No part of the year is entirely free from typhoons, but they are especially abundant during the late summer. Typhoons visit Kwang-

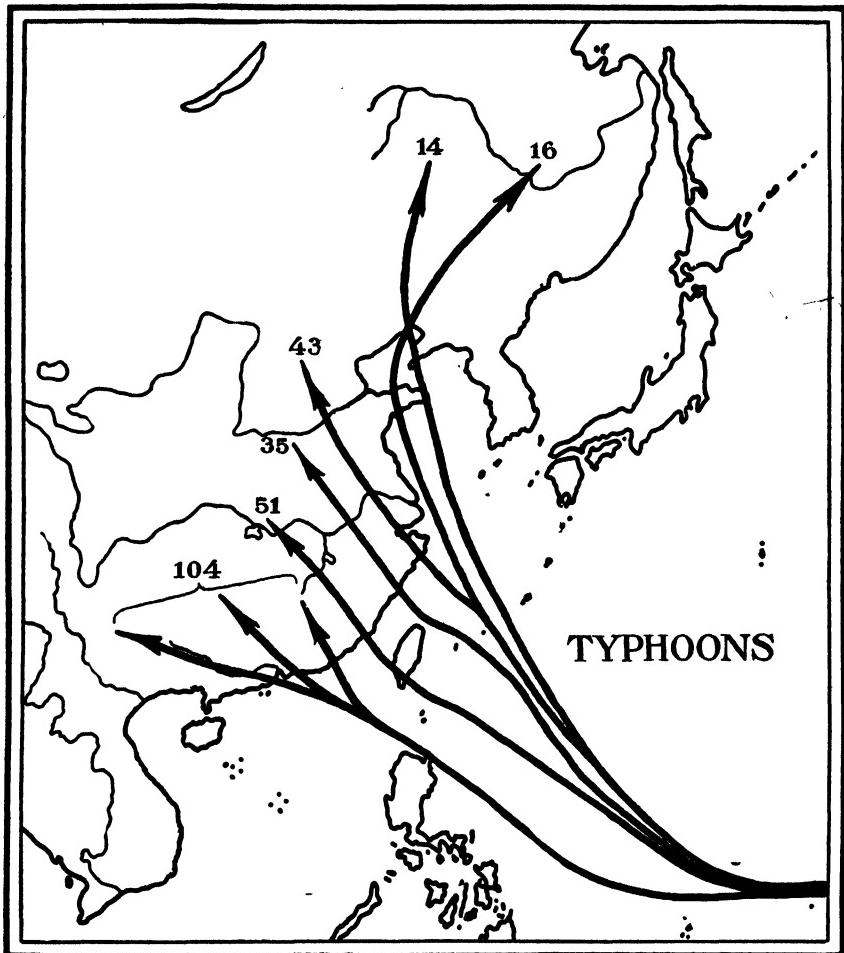


FIG. 37.—The average paths of tropical typhoons from 1893 to 1924. (*After E. Gherzi, Zikawei.*)

tung during May, but by June the track of most storms has moved northward to Formosa. July and August are the most destructive months along the central coast, and by October the increasing pressure of the Siberian high appears to be sufficient to keep typhoons away from the coast.

Typhoons always have a succession of rain squalls. The wind blows with exceptional velocities and carries the rain horizontally with such violence that severe damage is often done to ships and coastal districts. Much of the summer rainfall of the southeastern provinces is derived

from these tropical storms, in contrast to the gentle spring rains which are associated with cyclonic areas.

CLIMATIC REGIONS

China is both vast and diverse. Marked climatic contrasts differentiate the subarctic North and the tropical South as well as the low coast and the lofty mountains of the interior. Some of these conditions are shown graphically on the maps of temperature and rainfall in this chapter and also in the charts for each geographical region. During the winter months there is a sharp contrast or temperature gradient from north to south. In January the isotherms extend roughly east and west and are closely spaced. During July, on the other hand, there is a fairly uniform distribution of warmth throughout the country, shown by the widely spaced lines, some of which trend almost north and south. The winter contrasts are related to the Tsingling and other east-and-west mountains which tend to keep the Siberian air from the southern provinces where partial maritime influences still prevail. During the summer these same mountains serve as a barrier to some of the tropical winds, but the broad dry plains of the North heat up faster than the forested sections of the South, so that they may even become warmer, despite their higher latitude. Thus Peiping is not infrequently hotter than Canton, 1,200 miles to the south.

Various world-wide schemes of climatic classification have been proposed, the best known being that of Koeppen.¹ This classification is not particularly suitable for the climates of China, and Koeppen's map needs considerable revision in the light of fuller knowledge. Because of the wide use of Koeppen's scheme in other countries, however, the following notes may be of passing interest. Eight types, each shown by a combination of letters, are found within China, as follows.

BSkw, Cold Steppe Dry Winter Type.—The precipitation is less than 50 cm. where the mean annual temperature is 15°C., and less than 40 cm. where the temperature is 10°. The average yearly temperature is below 18°C. throughout. The region includes most of Mongolia, central Koko Nor, Kansu, northern Shansi, and Shensi.

BWk, Cold Desert Type.—The precipitation is less than 25 cm. when the mean annual temperature is 15°C. and under 20 cm. where the temperature is 10°. Temperature conditions are similar to BSkw. The Taklamakan Desert of Sinkiang is the chief Chinese example.

¹ KOEPPEN, W., *Klassifikation der Klimate nach Temperatur, Niederschlag und Jahresverlauf*, *Petermanns Mitteilungen*, XLIV (1918), 193–203, 243–248. See map and review by Robert de C. Ward in *Geographical Review*, VIII (1919), 188–191.

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Cw, Warm Dry Winter Type.—The coldest month averages between 18 and $-3^{\circ}\text{C}.$, and the rainiest month in summer has at least ten times as much precipitation as the driest winter month. Koeppen's map is particularly unsatisfactory here, for he includes large parts of both North and South China, whereas it should probably be limited to the South.

Cfa, Warm Wet Type.—The mean temperature of the warmest month is over $22^{\circ}\text{C}.$, and the contrast between the wettest and driest months is less than ten to one. This region includes all of the Yangtze Valley below Ichang, not shown by Koeppen, and a narrow coastal strip from Shanghai to Foochow.

Df, Cool Wet Type.—The coldest month averages below $-3^{\circ}\text{C}.$, with no dry season. Examples are found in Yunnan and along the eastern margins of the Tibetan plateau.

Dwa, Cool Dry Winter Type.—Mean temperatures during the coldest month are below $-3^{\circ}\text{C}.$, and during the warmest month over 22° . The winters are dry. Much of Manchuria, Hopei, Shansi, southern Shensi, and Honan are included.

Dwb, Cool Dry Winter Type.—Climatic conditions as in Dwa, except that the warmest month is below $22^{\circ}\text{C}.$. These conditions are found in northern Heilungkiang, eastern Kirin, and northern Mongolia.

Dh, High-altitude Tundra Type.—The warmest month has a mean temperature between 0 and $10^{\circ}\text{C}.$. This region includes the greater part of the Tibetan Plateau as well as the Tien Shan and Pamirs in Sinkiang.

The only climatic subdivision devised specifically for China on a purely meteorological basis is that of Dr. Chu Coching,¹ Director of the National Research Institute of Meteorology. This classification recognizes the particular controls which prevail in China and gives appropriate weight to the varying significance of rainfall and temperature in specific areas. The following analysis of the eight types, with minor modifications in wording, is taken from Chu's description.

1. *South China Type.*—This region has a mean temperature in the coldest month (January) over $10^{\circ}\text{C}.$ The January isotherm of 10° nearly coincides with the mean annual of 18° . The latter, however, is of less significance than the former. The mean annual range varies from 12 to $20^{\circ}\text{C}.$ Precipitation exceeds 100 cm. and is usually over 150 cm. Typhoons invade this region in the months of June to September, when the maximum rainfall occurs. The region includes the prov-

¹ CHU COCHING, The Climatic Provinces of China, *Memoir 1*, National Research Institute of Meteorology, Nanking (1930).

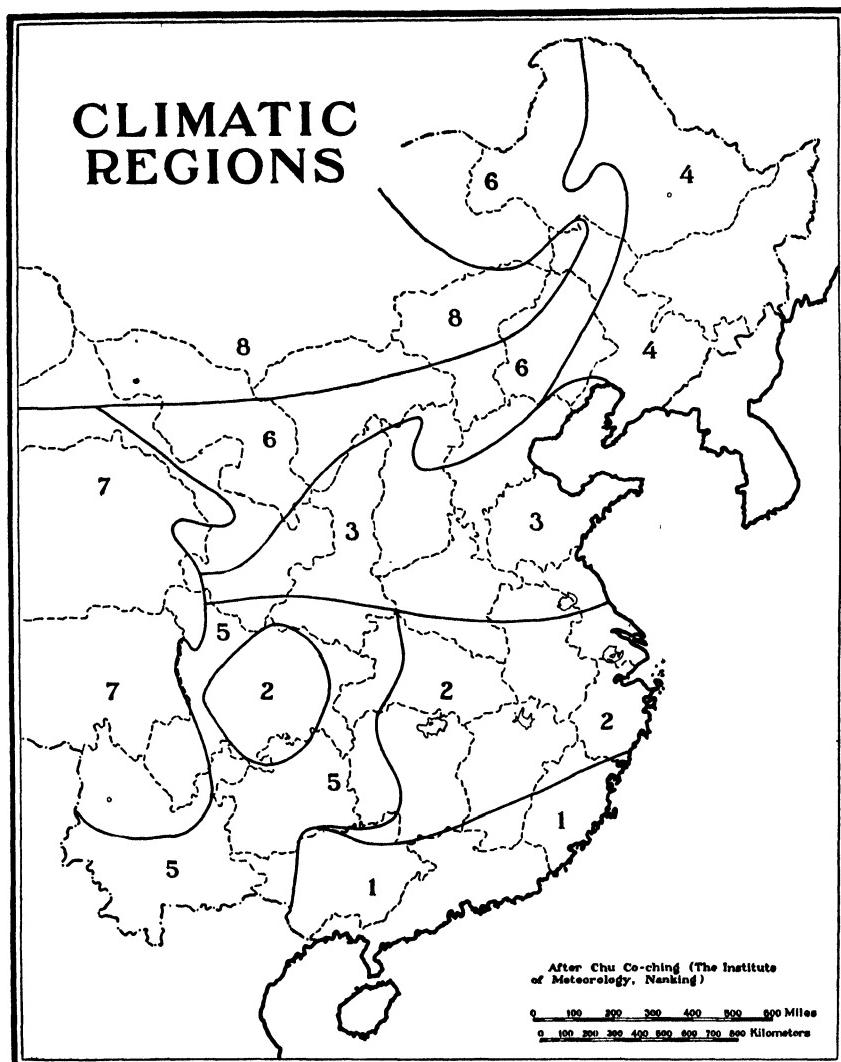


FIG. 38.—The climatic regions of China. 1, South China type; 2, Central China or Yangtze Valley type; 3, North China type; 4, Manchurian type; 5, Yunnan Plateau type; 6, Steppe type; 7, Tibetan type; 8, Mongolian type.

inches of Kwangtung and Kwangsi, the southern part of Fukien and Kweichow, and the extreme southeastern corner of Yunnan. It agrees quite well with the tropical deciduous forest region of China. Tropical fruits like lichee, banana, and pineapple are the characteristic products of this region. Three crops of rice a year are raised here!

2. *Central China or Yangtze Valley Type.*—The mean temperature of the winter months here goes below 10°. Its northern boundary is the November isotherm of 10° (that is, it has at most four months of mean temperature below 10°). The mean annual range is higher, varying from 18 to 25°, and rainfall amount smaller but still over 75 cm. In winter and spring, extratropical cyclones frequent this region; hence the winter is comparatively wet and rains occur in the months of April to June. The typhoon reaches here only in July and August, and its effect does not go very far inland. This is the region of temperate deciduous forest; most of the tea produced in China is grown in this region.

3. *North China Types.*—In this region the mean temperature of November is below 10 but above 0°C., and the mean annual above 10°C., while the annual range of temperature amounts to 25 to 35°. It is separated from the region to the west by the isohyet (line of equal rainfall) of 40 cm. The rainfall maximum occurs in the month of July, and the winter is quite dry. The annual precipitation varies greatly from year to year in this part of the country, as well as in the district west of it; hence famines occur very frequently. This region includes all of the provinces of Shantung and Honan, northern Kiangsu and Anhwei, and southern Shensi, Shansi, and Hopei. Wheat and millet are the staple crops here instead of rice.

4. *Manchurian Type.*—At least five months each year have a mean temperature below 0°, with a mean annual below 10°C. The growing season is limited to five or six months, and the winter is extremely cold. The Liao Ho in south Manchuria is frozen for four months, the Sungari River for five months, and the Amur River in north Manchuria for six months in the year. The annual precipitation varies from 40 to 60 cm., half of which falls in July and August, just about the time plants need water most. The 40-cm. isohyet marks the western boundary of this region, which includes practically all of Manchuria with the exception of the extreme western part. It is a region of narrow-leaved evergreen forest. Spring wheat and soy beans are the main agricultural products.

5. *Yunnan Plateau.*—Owing to the altitude of this region, varying from 1,000 to 3,000 meters, it has an ameliorated tropical climate. The mean annual temperature is from 14 to 18°C., and the annual range amounts to only 12 to 15°. The annual precipitation usually exceeds 75 cm.

6. *Steppe Type.*—This region, comprising the northwestern corner of China proper, southern Jehol and Chahar, and the western part of Manchuria, has a mean annual rainfall of 20 to 40 cm., and a mean

annual temperature of 5 to 10°, which would be called a steppe according to Koeppen's definition.

7. *Tibetan Type*.—Found in regions with an altitude over 3,000 meters.

8. *Mongolian Type*.—The meteorological data for Mongolia, Sinkiang, and Tibet are very meager, and how much of the region belongs to steppe and how much to desert one cannot say at present.

Detailed climatic descriptions of the various geographical regions, together with diagrams of rainfall and temperature, will be found in the appropriate chapters.

CLIMATE AND MAN

The human desirability of a climate is governed by such factors as temperature, rainfall, humidity, wind, sunshine, seasonal change, and day-to-day variability. These conditions may be presented in statistics and maps, but just how do they actually feel and how does man react to them? Does China have a climate which is conducive to physical health and mental vigor? Much of the country is considerably warmer than the important parts of Europe and the United States. Owing to its Siberian influences, however, China apparently has the coolest climate for its latitude in the world. But even so, most of the country is distinctly warmer than other leading nations. Nanking lies nearly five hundred miles south of Washington and thirteen hundred miles south of London. Only north of Peiping does one find temperatures similar to those of Western Europe and the northern United States. Heat and oppressive humidity dominate South China, so that in Canton Europeans wear white clothing for ten or eleven months in the year.

Variability is a climatic factor which has been emphasized by Ellsworth Huntington¹ and others as being conducive to mental and physical activity. Thus those regions having a procession of cyclonic storms are thought to enjoy a stimulus which is lacking in the monotony of monsoon lands. On the basis of world weather conditions, Huntington has prepared maps of climatic desirability and compared them with the distribution of "civilization" as judged by scholars of various countries. His maps show areas of very high climatic energy in the United States and Western Europe but were drawn before the extent of cyclonic storms in China was appreciated, so that China is placed in an intermediate category. On the basis of our present

¹ HUNTINGTON, ELLSWORTH, "Civilization and Climate," New Haven: Yale University Press (1915).

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knowledge, it would appear that the succession of stimulating weather conditions in central and northern China, produced by cyclonic storms, would entitle her to a somewhat higher rating. It is at least clear that the recurrent advance of cold Siberian air serves to moderate the warmth of the subtropical areas.

The high summer temperatures of almost all parts of the country not only have their direct debilitating effect on ambition, but they also make problems of sanitation more difficult. Cholera, malaria, and numerous other diseases have their environmental background in the heat and humidity of the summer months.

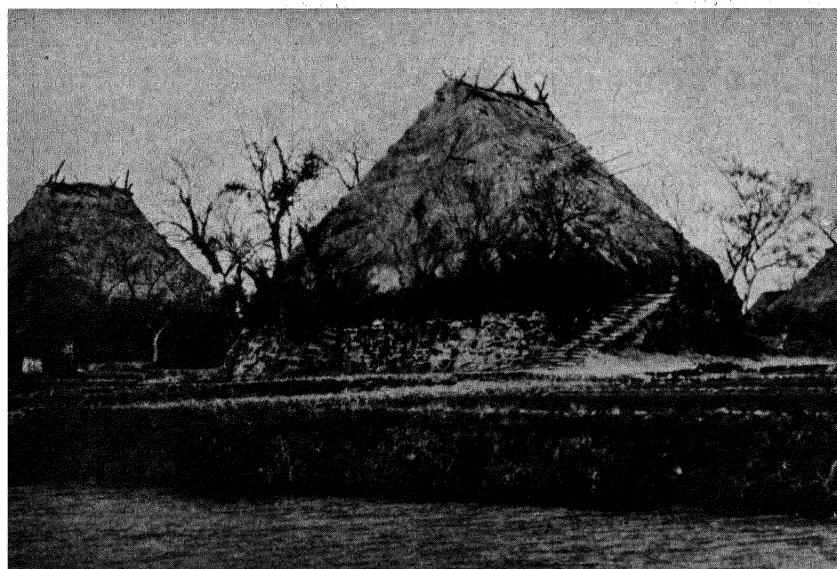


FIG. 39.—These ice houses near Ningpo mark the southernmost limit of ice, here harvested in sheets no thicker than window glass and used in connection with the extensive fishing industry. (*Atto Photographic Association.*)

Two climatic characteristics of human interest stand out: the winter dust storms of the North and the high summer humidity of the South. The North China Plain and the Loess Highlands are famous for the dust storms which occur from late autumn until early spring, when the ground is dry and free from vegetation. These thick dust clouds are especially famous in Peiping, from which they are often named. Much of the dust here is local in origin, being blown up from the unpaved streets. Clouds of it sweep over the city, penetrating tightly closed houses so that everything is covered with fine silt.

It is popularly supposed that the dust storms originate in the Gobi Desert, but such is only indirectly the case. The plateau of Mongolia is today relatively free of fine material, its fine weathered products having long since been blown southward to build up the thick deposits of loess. These loess hills together with the dry flood plains of the rivers and the bare fields are the immediate source of most of the dust of North China. Each strong wind lifts fine material and carries it another step on its southward journey, so that the dust in any particular storm is chiefly from local sources.

High clouds of very fine dust are occasionally observed as far south as Shanghai, but these have probably originated in Honan or Anhwei rather than in the far northwest.

/ The *mai yu*, or moldy period, occurs during the summer in the Yangtze Valley and south. The humidity is very high, and the moisture condenses on all cool objects. Walls and ceilings drip with water, and perspiration fails to evaporate. The bindings of books become moldy, and shoes grow whiskers of fungus overnight. Food spoils quickly and one's disposition is not of the best.¹

In all parts of China there are occasionally very heavy rainfalls. Changteh in Honan received 450 mm. (18 in.) in 24 hr. in August, 1923, while Hongkong had 707 mm. (28 in.) in 24 hr. in May, 1889. Little wonder then that rivers are occasionally in flood. The Yangtze regularly rises several tens of feet in the summer, and dikes are occasionally overtopped.¹

"When the rivers of the plain burst their dikes the whole flat expanse of green crops entirely disappears. The landscape is hidden by what appears to be a boundless expanse of waters, from which a few trees on grave mounds or the mud walls of villages alone project. When the waters subside once more the landscape is a drab profitless expanse, and those who have escaped the waters are often condemned to die of hunger on the very lands which before the floods were giving promise of heavy crops. It is not without reason that the Chinese have given almost sacred honours to the man who first taught their ancestors to build dikes against the summer floods."

At other times droughts may be of even greater devastation. Thus Lungchow in Kwangsi with a 28-year average rainfall of 1,269 mm. received but 197 mm. in 1902.

Man lives very close to nature in China, and no environmental factor is more important than climate.

¹ BUXTON, L. H. DUDLEY, "China, the Land and the People," 280.

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TABLE III.—AVERAGE TEMPERATURE, DEGREES CENTIGRADE

Station	Province	Latitude, north	Longitude, east	Altitude, meters	Number of years record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
Aigun.....	Heilungkiang	40°50'	122°38'	10	6	-25.5	-17.5	-10.4	2.8	10.6	17.2	20.8	19.5	11.7	2.5	-11.7	-24.1	-0.16
Amoy.....	Fukien	24°37'	118°38'	4	25	-14.8	-13.5	-15.3	19.4	23.4	29.0	29.0	29.0	29.0	29.0	29.0	29.0	-21.90
Antung.....	Liaoning	40°06'	120°31'	9	5	-8.7	-4.0	1.2	9.1	15.3	20.9	23.9	24.5	19.3	12.2	1.8	-7.4	9.30
Canton.....	Kwangtung	23°07'	113°16'	15	5	(18.7)	(14.9)	(17.2)	(21.1)	(24.8)	26.9	29.1	(27.0)	27.3	24.1	20.2	16.5	16.5
Changsha.....	Hunan	28°12'	112°37'	60	6	6.1	7.5	10.5	17.0	21.7	26.1	30.2	29.9	25.0	18.6	12.9	6.0	17.67
Chefoo.....	Shantung	35°58'	121°32'	3	37	-4.7	-0.4	4.4	11.9	18.2	22.7	25.4	25.7	21.1	16.9	11.6	6.0	16.5
Chengtu.....	Szechwan	30°40'	104°03'	4	6.8	7.8	12.5	17.4	21.4	24.2	25.8	25.8	21.6	17.6	13.1	8.0	16.81	
Chinwangtao.....	Hopei	31°35'	119°38'	...3	7	-6.1	-3.3	1.4	9.1	15.6	20.4	23.8	24.3	19.4	12.7	6.4	9.76	
Chungking.....	Szechwan	29°34'	106°31'	230	25	9.2	9.9	14.2	19.7	25.0	29.0	29.1	24.4	19.4	14.8	10.2	18.80	
Dairen.....	(Kwantung Territory)	38°56'	121°16'	15	10	-4.7	-3.2	1.4	8.9	15.3	20.3	23.3	24.4	14.3	13.2	5.2	-1.7	
Erhsihisekkingtui.....	Suriyan	40°36'	106°30'	1,025	3	-15.1	-9.3	0.0	8.1	15.3	20.4	22.7	20.9	14.3	6.7	-4.3	-15.2	5.36
Foochow.....	Fukien	25°58'	119°27'	20	14	11.7	10.9	13.5	18.0	25.5	26.8	28.9	29.1	26.6	22.6	17.7	13.1	20.18
Hankow.....	Hubei	30°35'	114°17'	36	28	4.5	5.9	10.2	15.1	21.0	24.5	29.5	29.7	24.8	19.2	12.9	7.0	17.16
Hangchow.....	Chekiang	30°11'	120°12'	10	10	4.7	5.4	9.1	15.0	20.0	24.5	28.3	27.9	23.2	18.2	11.8	6.0	16.92
Harbin.....	Kirin	42°25'	124°50'	147	6	-17.8	-14.6	-7.6	5.2	13.0	18.3	22.0	21.5	14.2	5.0	-6.7	-17.6	2.85
Hongkong.....	(British)	22°38'	114°10'	32	32	-15.8	-14.4	-17.4	21.5	25.5	27.8	27.4	21.4	16.4	9.2	-1.0	-8.7	22.22
Hunchun.....	Kirin	45°53'	131°18'	104	32	-12.5	-12.7	-4.3	4.8	10.9	17.6	22.4	22.4	16.8	9.5	-9.5	-19.1	15.20
Hwokutu.....	Anwei	32°32'	116°15'	...23	3.1	5.2	9.0	15.2	19.9	24.3	27.5	27.8	22.4	16.8	9.5	-17.0		
Ichang.....	Hupei	30°42'	111°16'	518	34	5.6	7.0	11.5	17.6	22.4	26.4	29.0	29.0	24.4	19.2	13.4	8.0	17.77
Kirin.....	Kirin	43°48'	126°22'	210	3	-16.9	-12.0	-5.8	6.4	13.9	22.7	22.4	15.3	5.4	-8.5	-14.5	4.39	
Kinkiang.....	Kiangsi	29°45'	115°38'	29	10	-4.7	-5.6	-10.6	16.7	21.9	29.8	29.8	25.0	18.0	10.2	5.4	17.40	
Kungchuling.....	Liaoning	43°31'	123°38'	203	1	-15.6	-12.6	-0.4	8.8	16.9	24.2	25.1	23.3	17.4	10.5	0.4	-11.3	7.2
Liangchow.....	Kansu	35°04'	102°46'	...266	9	-6.7	-0.4	3.6	11.6	16.3	21.4	22.8	21.6	16.8	9.3	1.7	-3.8	
Lungchow.....	Kwangsi	22°32'	106°45'	...	...	14.0	14.6	18.3	21.3	26.8	28.7	28.0	27.4	26.7	23.9	19.5	17.1	22.2
Mukden.....	Liaoning	41°48'	123°23'	44	10	-13.0	-10.0	-2.0	8.0	15.5	21.0	24.2	23.2	16.5	8.9	-1.6	-10.2	
Nanking.....	Kiangsu	32°05'	118°49'	16	10	3.1	4.2	8.3	14.0	19.9	24.0	27.4	27.3	22.6	17.3	10.3	4.5	15.25
Nantung.....	Kwangsi	32°32'	108°03'	122	5	1.6	1.2	14.3	18.0	23.6	29.0	29.0	23.3	17.4	14.8	21.87		
Ningpo.....	Chekiang	31°37'	120°55'	10	1	2.8	2.8	8.5	14.9	19.7	23.8	27.6	22.9	17.6	10.7	4.8	16.1	
Paoing.....	Hopei	28°53'	115°48'	22	1	-4.5	-1.2	7.5	14.0	21.3	25.2	26.9	24.8	20.7	12.9	8.8	-16.8	23.03
Pekhoi.....	Kwangtung	21°59'	109°05'	5	33	-15.5	-14.8	18.2	23.5	27.7	29.0	28.4	27.8	25.3	20.8			

TABLE III.—AVERAGE TEMPERATURE, DEGREES CENTIGRADE.—(Continued)

Station	Province	Latitude, north	Longitude, east	Altitude, meters	Number of years record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
Samashui	Kwangtung	23°06'	119°35'	10	16	14.3	13.6	17.1	21.7	25.6	28.1	28.9	29.3	27.6	24.4	19.2	14.7	21.99
	Hupel	30°18'	119°15'	51	10	4.8	5.7	9.6	15.3	21.0	24.9	27.3	27.8	23.0	17.8	11.7	6.3	16.26
	Shansi (Zikawei)	31°12'	121°26'	7	44	3.3	4.0	7.8	13.4	18.6	22.0	26.8	26.8	23.7	17.4	11.1	5.6	15.04
	Swantze	40°38'	115°18'	5	1,167	-11.3	-9.3	-0.8	8.8	16.0	21.7	22.6	20.4	15.4	8.4	-4.4	-11.2	
	Swatow	23°23'	116°40'	4	30	15.0	14.1	16.6	20.6	24.4	27.3	28.5	28.4	27.4	24.2	20.0	16.2	21.98
Taining	Hainan	36°18'	115°18'	4	-2.1	0.5	5.8	14.3	21.9	25.7	28.8	27.5	21.4	16.0	6.9	0.4		
	Taiyuan	37°53'	116°29'	805	1	-5.1	-2.7	6.7	12.3	20.8	24.2	27.9	22.6	17.6	10.7	0.3	-7.8	10.6
	Tengyueh	92°45'	98°14'	1,635	-5	-8.0	9.7	12.3	15.9	18.0	19.7	20.6	20.2	19.8	16.9	12.8	8.7	15.21
	Tientsin	39°08'	117°11'	5	10	-4.1	-1.8	4.7	12.7	19.5	23.7	25.9	20.8	14.2	4.5	-2	4	
	Tsingtao	36°04'	120°19'	74	15	-0.4	0.4	4.7	10.4	16.1	20.0	23.3	24.9	21.2	16.0	8.1	1.4	12.11
	Wenchow	28°01'	120°10'	3	29	8.3	8.4	11.5	16.3	20.8	24.9	28.1	28.2	25.5	20.9	15.8	10.8	18.45
	Chekiang	35°26'	114°14'	...	3	-0.4	2.1	7.7	14.9	21.6	27.1	25.8	20.7	13.8	4.1	-2.2		
	Weihwei	32°39'	111°30'	...	10	18	14.1	13.9	17.1	21.6	25.9	28.1	29.1	28.0	24.4	19.4	15.3	22.25
	Wuchow	31°26'	118°21'	15	36	14.0	4.9	9.1	15.3	20.7	24.9	28.1	28.4	23.9	18.6	12.0	6.2	16.33
	Wuhu	40°41'	122°16'	3	13	-8.7	-6.6	0.1	9.3	16.3	21.8	24.9	24.6	19.0	11.5	1.7	-6.0	8.74
	Yingkow	29°24'	118°10'	76	6	-4.8	5.4	8.8	14.6	19.5	23.8	26.2	27.9	21.2	16.1	10.1	4.2	16.16
	Yochow	23°04'	105°40'	1,980	2	9.1	10.3	15.5	19.9	21.8	22.1	22.1	21.3	18.8	17.3	13.3	9.7	16.72
	Yunnan																	

Derived largely from the reports of Zikawei Observatory.

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TABLE IV.—AVERAGE RAINFALL, MILLIMETERS

Station	Province	Latitude, north	Longitude, south	Altitude, meters	Number of years record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total rainfall	Number of days of rain
Anoy.....	Fukien	24°27'	118°05'	4	34	32.4	77.3	89.0	125.7	157.6	177.4	188.2	167.7	109.5	49.3	31.8	1,182.5	108.2	
Autung.....	Liaoning	40°06'	124°21'	9	17	9.9	11.2	24.3	37.4	90.1	100.4	97.2	3.3	24.4	41.2	5.7	1,001.3	79.3	
Batang.....	Szechwan	30°01'	99°03'	2,000	2	0.0	2.0	1.3	8.1	28.7	108.0	139.0	128.0	127.6	27.8	0.1	0.0	670.6	84.6
Canton.....	Kwangtung	23°07'	113°26'	15	17	49.6	75.0	148.5	254.2	264.7	271.3	282.5	184.6	63.2	44.4	35.5	1,699.2	186.7	
Changsha.....	Hunan	60	14	45.0	96.5	82.8	116.8	188.8	218.1	131.1	131.1	85.1	89.2	78.9	44.0	1,412.4	145.0		
Changsha.....	Shantung	37°32'	121°27'	3	38	12.9	10.5	16.5	22.5	84.4	60.4	169.7	165.8	64.1	25.0	28.6	17.1	119.8	87.4
Chaofo.....	Szechwan	30°40'	104°03'	...6	8.4	10.5	12.2	48.0	56.1	113.0	203.2	22.6	108.8	47.8	14.9	4.5	880.0	119.8	
Chenkuangtao.....	Hopei	39°55'	119°38'	3	16	2.9	3.0	15.8	16.1	71.3	135.1	187.7	79.7	26.7	13.6	2.1	673.0	71.9	
Chungking.....	Szechwan	29°34'	106°51'	250	28	16.5	20.0	35.2	102.0	140.6	181.1	142.7	130.5	147.3	114.8	49.6	22.0	1,102.6	131.6
Dairen.....	(Kwantung Territory)	38°56'	121°16'	15	19	11.9	8.0	20.0	26.7	46.6	49.7	160.7	123.2	114.9	30.7	26.2	9.5	638.1	77.0
Erhahisektingti.....	Suiyuan	40°36'	110°30'	1,025	7	0.3	3.8	3.4	5.2	14.1	61.1	101.9	78.0	47.3	14.9	1.8	3.2	335.0	34.8
Foochow.....	Fukien	25°39'	119°27'	20	35	47.0	98.3	115.0	121.8	149.7	208.1	161.0	182.0	214.3	50.9	41.4	47.2	1,454.7	102.0
Fukow.....	Hunan	34°08'	114°30'	7	14.2	17.1	11.9	32.0	58.4	90.4	225.1	117.4	62.0	20.9	16.4	12.4	678.2	67.9
Hankow.....	Hopei	30°36'	114°17'	36	45	44.7	49.2	52.0	152.0	166.0	242.8	181.2	97.3	79.3	82.3	48.0	27.0	1,258.5	99.8
Hangchow.....	Chekiang	30°11'	120°17'	10	15	61.7	84.8	136.6	146.3	311.0	248.7	151.1	61.6	134.0	107.3	80.2	1,500.6	174.0	
Hazou.....	Kirin	45°46'	196°50'	147	18	4.1	5.9	8.4	23.5	40.7	104.8	147.3	104.0	53.9	50.0	8.4	6.3	656.6	108.2
Hinggan.....	Shensi	32°40'	109°15'	3	3	3.6	2.5	7.7	49.8	111.0	2.0	105.5	163.5	48.6	32.5	18.4	79.7	70.1	
Hongkong.....	(British)	22°18'	114°10'	32	41	32.7	44.5	68.0	134.9	304.2	402.5	536.0	571.9	247.0	130.1	43.2	2,102.3	166.5	
Hsinchihien.....	Hopei	38°17'	116°5'	....	7	4.4	1.7	5.2	8.0	27.3	57.7	109.8	89.2	28.0	6.2	2.6	341.7	28.0
Huchchun.....	Kirin	42°53'	131°18'	104	10	1.6	1.3	11.1	30.4	78.7	73.7	92.4	111.9	108.0	39.9	2.2	574.2	71.6	
Hwoiu.....	Anhwei	32°32'	116°15'	6	52.6	19.4	81.5	59.0	51.1	260.0	138.0	144.9	82.4	60.8	49.3	13.6	1,063.8	98.8
Ichung.....	Hopei	30°42'	111°16'	518	42	19.5	29.1	53.6	100.6	122.6	154.8	210.8	169.5	100.4	84.0	35.8	14.1	1,094.8	106.6
Kalgan.....	Chahar	40°48'	114°39'	2,470	6	0.7	4.1	5.6	3.5	44.1	46.3	138.6	92.0	30.1	15.7	2.5	1.6	385.7	63.3
Kirin.....	Kirin	43°48'	126°22'	210	3	0.0	0.7	2.3	2.8	87.1	87.7	126.7	208.4	130.9	37.3	25.0	669.6	65.8	
Kinkiang.....	Liaoning	29°05'	116°08'	40	62.5	82.7	150.9	181.2	173.9	242.7	114.8	131.1	88.6	97.0	68.1	43.8	1,465.7	125.5	
Kungchuling.....	Suiyuan	43°31'	124°38'	203	10	5.9	9.3	10.7	17.5	53.1	87.5	172.3	144.4	67.5	58.7	18.4	618.0	101.5	
Kweiwacheng.....	Kweichow	40°48'	111°38'	5	0.4	4.5	3.3	3.5	7.0	93.8	5.0	75.0	163.0	63.0	20.7	8.8	984.7	90.8	
Kweiyang.....		26°18'	106°40'	1,075	4	29.5	22.5	27.8	85.1	165.7	164.5	247.9	87.1	60.7	38.8	15.4	1,169.0	168.5	
Luan.....	Shansi	36°06'	113°03'	....	6	6.9	8.0	11.7	29.9	35.8	61.0	158.8	81.6	45.2	19.2	6.9	497.7	45.8
Lungchow.....	Kwangsi	22°32'	106°45'	266	28	19.2	27.0	47.7	84.6	171.4	216.0	222.7	331.4	133.3	53.6	40.8	21.6	1,269.3	86.6

CLIMATIC TABLES

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TABLE IV.—AVERAGE RAINFALL, MILLIMETERS.—(Continued)

Station	Province	Latitude, north	Longitude, south	Altitude, meters	Number of years record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total rainfall	Number of days of rain	
Mengzi.	Yunnan	23°29'	103°24'	94	9.0	15.7	26.6	42.5	123.1	129.1	179.2	191.2	105.9	54.6	13.5	924.8	116.2			
Mukden.	Liaoning	41°48'	123°23'	44	4.2	6.4	10.3	22.6	57.1	85.7	139.1	136.0	88.7	46.7	6.1	672.2	121.2			
Nanking.	Kiangsu	32°05'	118°49'	16	20	41.1	50.2	75.1	101.0	182.9	208.3	226.7	116.7	96.9	49.7	41.2	39.0	1,069.0	158.9	
Nanning.	Kwangsi	22°42'	108°03'	122	5	38.4	61.5	86.9	102.2	149.6	208.3	246.7	116.7	96.9	22.9	22.0	39.0	1,564.4	150.7	
Nanking.	Anhwei	33°41'	117°02'	7	10.7	9.2	25.7	20.9	15.7	48.1	118.5	120.0	68.0	20.5	24.4	16.2	49.9	98.7	158.7	
Nanchow.	Kiangsu	31°37'	120°35'	10	9	52.5	42.8	66.1	70.8	67.8	176.8	174.4	136.1	84.6	36.1	32.0	1,001.5	163.5		
Nantung.	Chekiang	29°57'	121°45'	10	39	68.3	88.1	109.9	118.2	170.0	176.1	177.4	110.9	62.9	47.9	1,386.4	111.8			
Peiping.	Hopei	28°53'	115°28'	22	4	0.5	6.2	10.5	8.4	27.2	19.2	162.7	109.0	30.0	5.3	1.1	1.3	381.4	96.4	
Pakho.	Kwangtung	21°29'	109°05'	5	39	32.0	33.1	76.0	107.2	171.1	292.8	503.0	506.6	272.5	81.2	45.4	48.1	2,169.3	123.1	
Samtsuhi.	Kwangtung	23°06'	112°53'	10	25	41.8	65.5	112.3	184.3	305.0	326.7	724.5	320.7	143.4	69.5	47.6	46.9	1,787.0	150.1	
Shan.	Hubei	30°18'	112°15'	51	15	31.4	42.1	86.7	127.8	153.9	176.0	205.4	161.6	86.9	94.7	64.2	19.1	1,827.8	168.8	
Shan.	Hunan	34°50'	111°00'	... 7	11	5.2	9.2	1.4	20.5	56.9	57.4	104.3	101.3	67.4	27.7	4.7	3.6	466.8	51.2	
Shancow.	Kiangsu	31°22'	121°26'	7	52	49.8	59.5	87.4	98.9	92.0	187.0	140.7	144.1	110.3	79.2	51.0	35.3	1,147.9	152.3	
Shanghai (Zikawei).	Chahar	40°58'	115°18'	1,167	15	2.1	2.6	7.7	9.4	65.1	60.0	87.4	41.1	36.6	16.9	6.7	2.8	387.8	89.8	
Swatow.	Kwangtung	23°23'	116°40'	4	44	35.3	62.2	79.9	145.9	229.5	286.6	1,197.2	212.2	138.6	73.0	39.4	38.1	1,616.3	99.2	
Tanning.	Hopei	36°18'	115°18'	... 15	10.8	9.1	13.3	17.2	20.0	64.8	158.0	145.0	88.0	16.1	12.4	3.5	536.2	44.9		
Tating.	Shansi	40°07'	113°18'	7	0.9	4.9	7.3	16.5	35.9	46.3	111.3	92.3	30.7	22.6	2.3	0.2	371.1	31.1		
Taying.	Shansi	37°53'	122°29'	805	7	6.8	1.0	8.6	8.4	15.4	44.1	125.2	85.6	39.4	14.8	0.0	1.7	361.0	30.6	
Tengchueh.	Yunnan	24°45'	98°14'	1,383	14	11.1	28.7	48.4	69.7	122.1	124.8	29.4	1,222.8	1169.8	138.6	36.3	18.2	1,478.6	159.7	
Tientain.	Hopei	39°09'	117°11'	5	35	8.5	2.4	10.3	17.0	27.3	64.2	175.9	153.5	48.4	16.0	9.8	5.1	569.9	44.1	
Tiantao.	Shantung	36°04'	120°19'	74	26	10.6	9.8	20.2	38.0	41.1	85.0	155.5	147.0	83.5	33.2	20.6	6.0	6.3	460.9	41.2
Tungkuemiong.	Shensi	34°30'	109°04'	365	4	3.0	0.5	7.4	33.6	59.3	47.2	91.3	133.9	60.4	32.0	6.0	6.0	34.0	90.6	
Wenchow.	Chekiang	28°01'	120°40'	3	40	46.6	98.8	122.7	158.0	179.9	264.8	198.5	224.8	204.2	93.5	57.2	40.4	1,689.4	148.7	
Weihwei.	Hunan	35°26'	114°14'	... 6	7	7.1	6.2	8.7	33.0	83.2	51.0	216.7	99.5	40.3	12.5	1.8	1.5	511.5	38.7	
Wuchow.	Kwangsi	23°52'	111°20'	10	26	30.3	49.0	86.7	171.7	202.6	196.3	166.9	178.8	98.9	35.9	43.9	38.2	1,938.5	125.6	
Wuhu.	... Anhwei	31°20'	118°21'	15	44	56.0	104.1	130.1	125.7	211.7	164.2	121.1	83.4	76.8	56.1	34.0	1218.6	101.1		
Yinkow.	Liaoning	40°41'	122°16'	3	22	5.5	4.9	26.2	26.8	53.2	64.1	157.5	156.0	74.8	39.2	24.5	6.3	659.0	77.5	
Yochow.	Hunan	29°24'	113°10'	76	15	32.4	73.1	143.2	153.3	152.2	925.8	115.2	73.7	96.6	108.5	34.1	15,832.5	192.3		
Yunnan.	Yunnan	25°04'	102°40'	1,980	16	13.4	12.9	13.7	18.3	95.6	154.8	238.5	206.6	156.3	92.3	44.2	10.4	1,040.3	113.0	

Derived largely from the reports of Zikawei Observatory.

CHAPTER IV

FARMERS OF FORTY CENTURIES

THE AGRICULTURAL LANDSCAPE

Agricultural China teems with active people. The landscape everywhere has a utilitarian aspect and betrays the lavish care bestowed upon the production of food. Cultivated land is almost universally devoted to crops grown for direct human utilization. In the



FIG. 40.—The stolid water buffalo is the principal draft animal in the rice lands. (*Mactavish and Company.*)

absence of animal husbandry, there are no pasture lands or hay fields. Orchards and wood lots are conspicuous for their absence, except on some hillsides. Wherever food can be raised, there the industrious Chinese farmer is at work. To increase the crop area, lowlands are protected by dikes and hillsides are terraced. Even apparently waste lands yield their contribution of grass for fuel.

Chinese agriculture has had a long and honored history. The title of this chapter, "Farmers of Forty Centuries," is that of a book by

F. H. King which vividly portrays man's intensive and continuous use of the soil. The culture of China has been built so largely on an agricultural foundation that the country has been described by F. J. Goodnow¹ as having a "vegetable civilization," for out of the soil, rather than from mines or forests, have come the materials of Chinese life. Approximately three-fourths of the people are farmers, and it is they who make up the real China. Agriculture forms the foundation of the social and economic structure of the nation, and only as the rural districts prosper can China advance. ✓

If one could see China from the air, the outstanding impression would be the miniature fields. Where the country is level, these microscopic plots are cut up into geometric shapes. In the hill country of the South, the rice terraces follow the contours, and the cultural landscape is strikingly irregular, especially when the fields are flooded and glisten in the sunlight like fragments of mirrors. Everywhere there is a superabundance of people and an undersupply of arable land; hence the crowded farms. The most detailed study of rural conditions is that made by John Lossing Buck of the University of Nanking, and his book "Chinese Farm Economy" has been used freely in the following pages. ✓

Open unfenced fields divided into small garden plots are the rule. Farms seldom measure more than 100 mow (17 acres) and are commonly divided into many small scattered plots. Studies of 2,540 farms in seven provinces of northern and east central China made by Buck give an average of 8.5 plots per farm, each nearly an acre in size. These scattered holdings average about a li (one-third of a mile) from the farmstead. Fields are larger and distances greater in the North, as is reflected in the use of carts for transporting crops and fertilizers in place of the carrying poles of the South.

Farm buildings are of pounded earth or brick in the North and of brick or woven bamboo in the South. Isolated houses are uncommon, and tiny villages dot the countryside about as individual farmhouses do in the West. Owing to the limited total area, the space for the farmstead is restricted, and there are no lawns. Trees, however, are commonly found around the houses. The buildings usually cluster about a courtyard, often without exterior windows and with but one gateway. A kitchen, a living room, and a few bedrooms suffice for the family, and there are in addition sheds for tools, fuel, and animals, if any. Threshing floors, manure pits, and vegetable gardens are found near the house.

¹ GOODNOW, F. J., "China, an Analysis," Baltimore: Johns Hopkins Press (1927).

The crops, for the most part, are similar to those found in the United States and Europe. Wheat, rice, soy and other beans, millet, barley, corn, melons, peanuts, cotton, tobacco, and vegetables, such as potatoes and cabbage, are widespread. One of the more distinctive crops is kaoliang, a grain sorghum which grows to a height of eight or ten feet somewhat resembling American broom corn with a frond of kernels at the top. The grain is the size of a small pea and of a

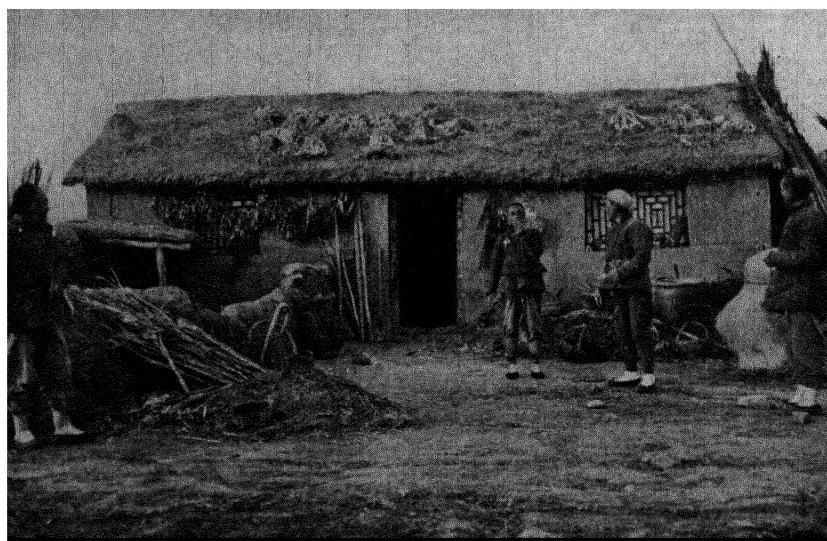


FIG. 41.—The typical farm house of North China is of pounded earth or sun-dried bricks. Leeks are drying on the roof, and peppers are hung under the eaves. (*Dollar Steamship Company.*)

brownish color. Wheat, kaoliang, and millet are raised in the dry North, while rice predominates in the humid South. All by-products, such as stalks or straw, are utilized for fuel, as fodder for labor animals, or for building. The variety of crops is much greater in the North where from a dozen to fifteen crops are raised in some localities as compared with but three or four in east central China.

Although the average farm is small, the production is usually increased by double cropping, the amount of which varies from none in Manchuria and the mountains of the northwest, where winters are too severe, to 100 per cent and more in the milder South, with an average for northern and eastern China, according to Buck, of 47 per cent.

The contest for subsistence has thus crowded out all but draft animals and types such as pigs and chickens which forage for them-

selves. Meat, other than fish, plays a small part in Chinese diet. More people can be supported in a given area if the food is used directly for human consumption instead of first being fed to animals. Dairy or beef cattle are rarely raised by the Chinese, except where produced for foreign consumption. The Mohammedans, however, eat beef and mutton in place of pork, and their butcher shops are to be found in all larger cities. Pigs and chickens are raised on most farms throughout

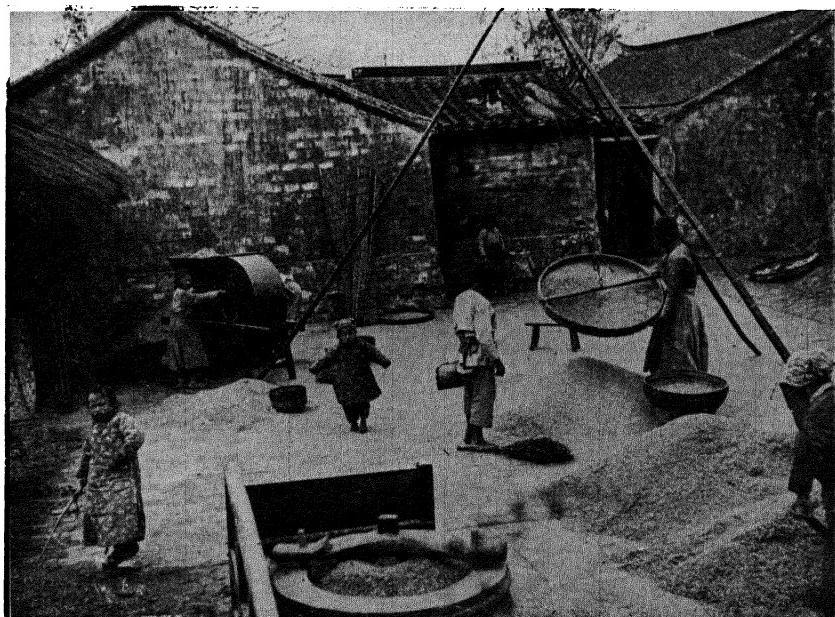


FIG. 42.—A courtyard scene near Shanghai, showing various devices for cleaning, sifting, and grinding grain. Bricks and tile in the South take the place of earth and thatch in the North. (*Mactavish and Company.*)

the country, with increasing numbers in the South. Most of the larger livestock are kept for work around the farm or for occasional transportation needs. Studies by Buck indicate that oxen are found on 52 per cent of the farms in the North and 31 per cent in the east central area. Water buffalo are absent in the North but are present on 40 per cent of all farms in east central China. Donkeys and mules are owned on 54 and 14 per cent respectively of northern farms, as compared with 7 and 0.4 per cent in the more southerly areas.

Inescapably present in every rural landscape are the conical mounds of earth which mark the graves of past generations. Where hill land is available, the graves are generally placed there and are marked with stone tablets. On the plains, however, stone markers

are absent and simple grass-covered mounds are the rule. In many areas, these graves occupy a considerable fraction of the potential crop land and are seldom located with a view to ease of cultivation. Estimates in scattered localities where only level land is present were made by students of the University of Nanking and show an average of 2.6 per cent of the farm area in grave mounds, with some localities rising to 7.8 and 9.1 per cent. Such is the price which the present pays for the past.

THE FOUNDATIONS OF AGRICULTURE

Broad alluvial plains are found in the east and north and ribbon-like flood plains border most rivers in the highlands. Vast areas of hill and mountain country are of little value for cultivation, but the Chinese have shown remarkable industry and ingenuity in terracing the slopes wherever the soil is deep enough. Outside the level deltas of the Yangtze and Si Kiang, much of China's rice is produced on terraced paddy fields, so constructed that the necessary water is led from one field to another by gravity. Terracing is also common in the loess lands of the northwest, although the soil is here too porous to hold water for flooded fields, and wheat or barley is grown in place of rice. Although terraces may be found throughout China, it is only in the soft red-sandstone areas of Szechwan that they reach a striking development. Further terracing is usually restricted by the thinness of the soil, the lack of water, or the excessive cost. Taking the country as a whole, only a very small percentage of the slope land has been leveled. Here and there, striking photographs are possible of whole mountain sides in terraced steps, but they are scarcely representative. It cannot too often be emphasized that much of China is handicapped by land forms which are unfavorable for agriculture.

The soils of China are as varied as her topography. In general, they are low in humus or organic matter and thus deficient in nitrogen, water-holding capacity, and tilth. Alluvial plains spread out by the Si, Yangtze, Hwang, and Liao make up large parts of the crop area. Such soil is fertile and easily adapted to cultivation. In places it is too sandy and many areas are subject to periodic floods. Perhaps the most famous of China's soils is the loess of the northwestern provinces. This is a fine yellow wind-blown silt which has been sprinkled over the countryside to a thickness of hundreds of feet as though by a giant flour sifter, burying all but the highest of the original hills. It is unique in its origin, erosion, perpetual fertility, and capacity to retain moisture. With more adequate rainfall it might form one

of the most productive soils in the world. Weathered soils on mountain sides cover large areas and are of many types but are often thin and stony. Torrential rains and the all-too-widespread removal of the forests have helped to strip off the normal veneer of weathered products, leaving bare rock or coarse soil.



FIG. 43.—Winnowing wheat from the chaff, near Tientsin. (*Dollar Steamship Company.*)

North China and the Mongolian borderlands have a low rainfall combined with excessive evaporation. Thus the various salts which normally weather out of rock materials are not adequately flushed out by the rainfall as in more humid regions but accumulate to excess and eventually may render the soil unsatisfactory for cultivation. Where ground water rises to the surface through capillary action and evapo-

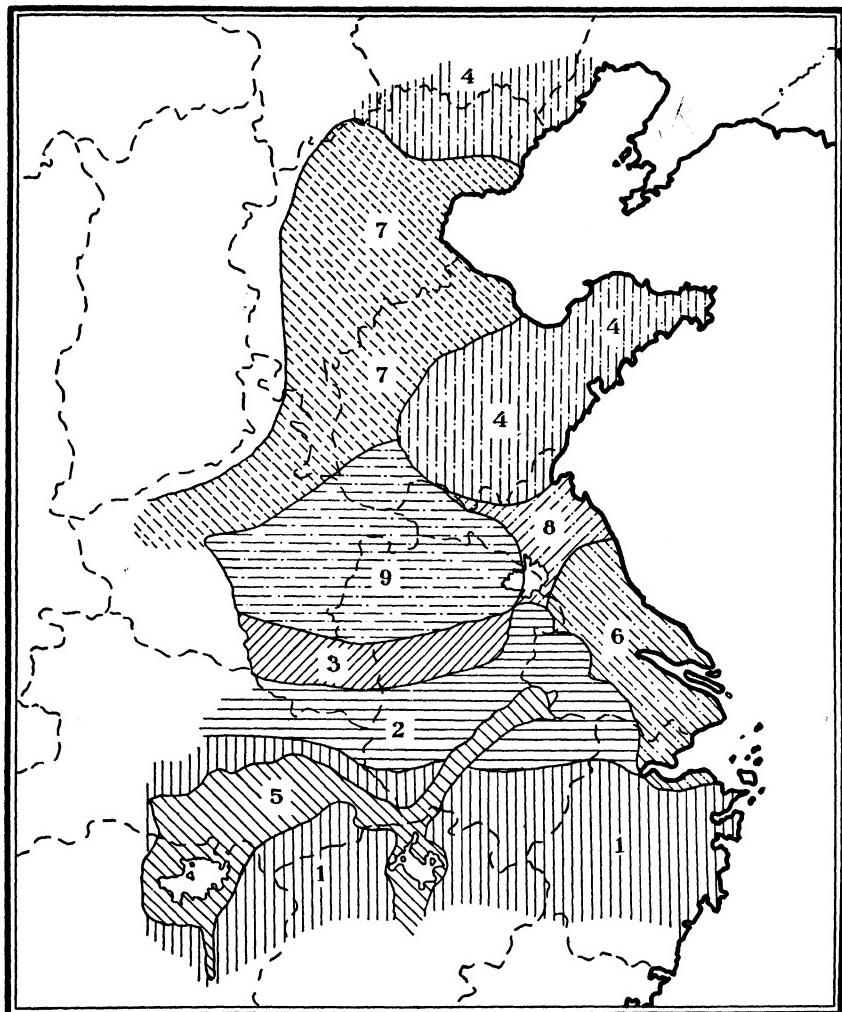


FIG. 45.—A preliminary map of the soil regions of China. 1, red-soil region; 2, claypan region; 3, Hwai Valley soils; 4, brown-soil region; 5, Middle Yangtze floodplains; 6, Lower Yangtze Delta; 7, Alluvial soils of the Northern Plains; 8, old Delta of the Hwang Ho; 9, Sajong soils of the Central Plains. (After C. F. Shaw.)

"7. The *Alluvial Soils of the Northern Plains* include the flood plains of numerous minor streams and also the present flood plains of the Yellow River. They are deep and fine textured, calcareous and generally saline, the salt content being sufficient to depress yields over much of their area. They are poorly drained and subject to severe flooding. These soils are quite productive

and support a dense population. Drought or floods are a constant menace and are the most common causes of crop failures and famine. Wheat and kaoliang are the major crops.

"8. Little is known of the soils of the *Old Delta of the Hwang Ho* as this region was not visited. They are calcareous and reported to be quite saline.

"9. The *Sajong Soils* occupy the great central plains area and are characterized by the presence of an horizon of lime concretions or sajong in the subsoil. They are quite calcareous and somewhat saline and are generally poorly drained. They are fairly productive, intensively farmed, and support a dense population. Wheat and kaoliang are the common crops. Yields are depressed by poor drainage, and the salt content of the soil, but the occasional crop failures are due to prolonged droughts or to excessive rains that cause local flooding of these very flat plains."

Accurate information on the length of the growing season in various parts of the country is difficult to secure. Average dates of the last killing frost in the spring and first killing frost in the fall are recorded in very few meteorological stations, and even approximations are not everywhere available. Rainfall is equally important with temperature, for crops will not grow unless the ground is moist. The figures given by geographic regions in the Statistical Summary at the end of the volume represent a first generalized attempt and have been checked against all available information. The minimum is found in the Khingan Mountains and the Central Asiatic Steppes and Deserts where the growing season does not exceed 100 days. Farther south, in the North China Plain, the figure rises to about 200 days. The Yangtze Plain averages 300 days, while in the far south the growing period continues practically throughout the year.

In a land as old as China, the soil has long since lost its initial fertility. Centuries of practical experience, however, have shown the best methods of cultivation, crop rotation, and fertilization. Agricultural practices have thus been developed which maintain soil fertility and conserve rather than exploit its productivity.

Although the best alternation of crops has not always been followed, there has been a general recognition of the fact that to maintain soil fertility it is essential to vary the crops. This has sometimes been practiced by means of interculture, whereby two crops are grown in alternate rows at the same time, usually timed so that the harvest does not coincide. By thus planting beans and kaoliang side by side, the same result is attained as if they were grown in alternate years.

In few countries has more careful attention been given to the question of fertilizers. In the absence of an extensive animal population, there is little manure. To supplement, ashes, bottom mud from canals or ponds, and purchased bean cake are employed. All animal wastes are collected and carefully applied to the plants at the proper seasons. This is particularly true of human waste or night soil, the collection and preparation of which is an important industry. Cities receive a considerable revenue for the concession, and in the early morning one may see long lines of wheelbarrows, carrier coolies, or canal boats engaged in transporting night soil. In the country districts many farmers whose land abuts on an important road construct comfort stations for the convenience of the passing traveler; and from the competition between adjoining farmers and the relative expense involved in erecting such shelters, one may judge of the very real value of the night soil in increasing the productivity of the land.

THE EXTENT OF CULTIVATED LAND

All statistics in China need to be scrutinized with considerable care. Some are fairly reliable, but too often they have been compiled without first-hand evidence, and with little regard to accuracy and comprehensiveness. Data on population or cultivated land have commonly been gathered through local magistrates primarily for taxation purposes and have been subject to modification accordingly.

TABLE V.—CULTIVATED LAND AT DIFFERENT PERIODS¹

Year	Dynasty	Cultivated land, mow	Population	Cultivated land per capita, mow
145	Han	695,767,600	49,524,183	14.04
1490	Ming	423,805,800	53,281,158	7.95
1578	Ming	701,397,628	60,692,856	11.55
1661	Ching	549,357,640	104,707,086	5.24
1766	Ching	740,449,550	182,076,774	4.07
1872	Ching	819,453,194	329,563,216	2.49
1916	Republic	1,384,937,701	409,500,000	3.38

¹ The first three figures are those quoted by D. K. Lieu and Chen Chung-min, Statistics of Farm Land in China, *Chinese Economic Journal* (March, 1928), 188–186, while the last four are listed by Chen Chang-heng, Some Phases of China's Population Problem, *Bulletin de L'Institut International de Statistique*, Tome XXV, 2^eme Livraison, Tokyo (1931), 18–54.

The various dot maps accompanying this chapter have been based, by permission, on work by O. E. Baker, Albert La Fleur, and Edwin J. Foscue. These original maps have been redrawn and extensively revised and enlarged to include Manchurian maps by Nobuo Mura-

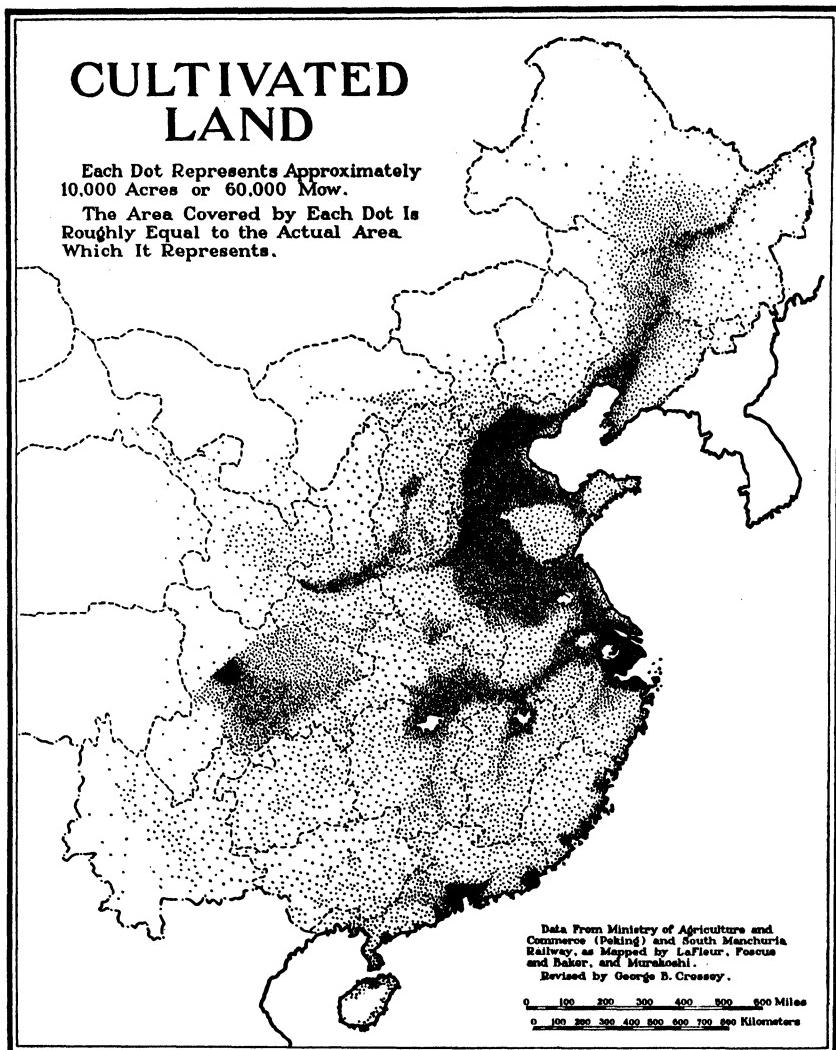


FIG. 46.—The distribution of cultivated land shows a remarkable adjustment to topographic conditions. This map should be compared with that of population, Fig. 10, page 20.

koshi. The present maps should be taken as representative of general relationships rather than statistical actualities.

During the past two thousand years, agricultural enumerations have been taken on the average of once in every fifty years, with increasing frequency in recent centuries. Some of these are shown in Table V.

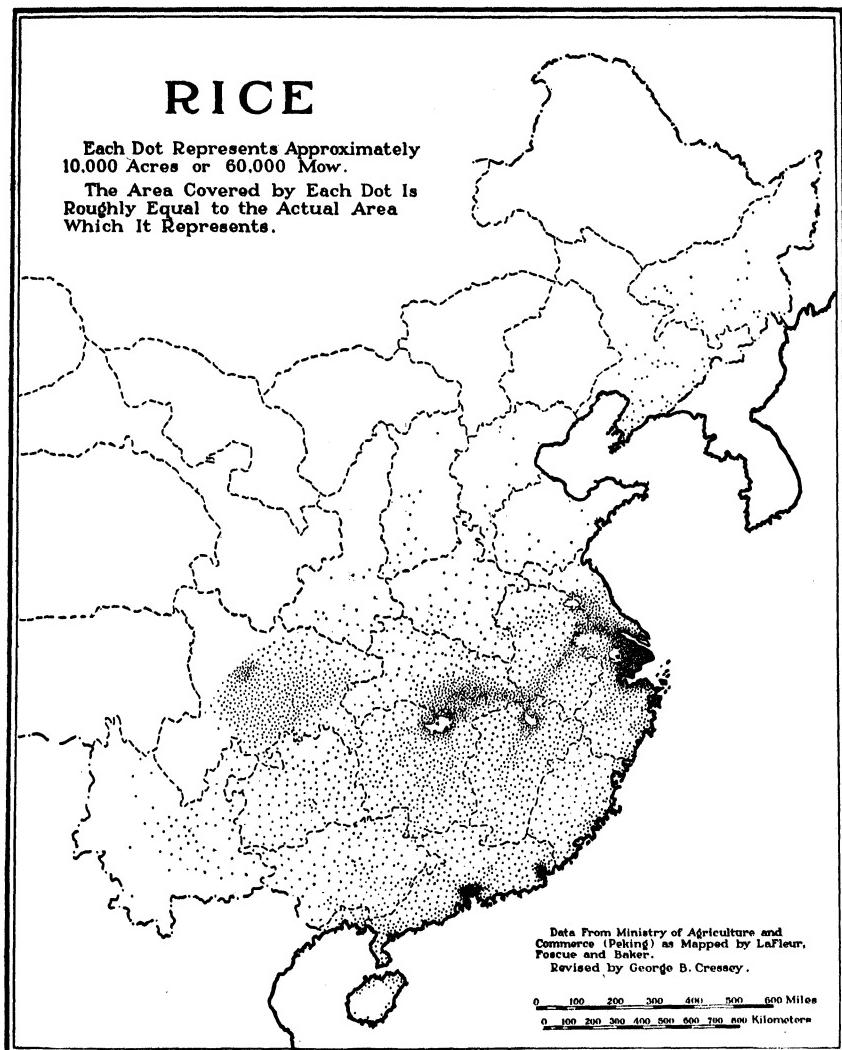


FIG. 47.—Rice will mature in all parts of China, but its widespread cultivation is limited to the South by custom, soil, and available water.

Information is not available as to the exact area covered by China at these times, but there is a striking contrast between the amount of cultivated land per person shown in the earlier years as compared with the situation today. All authorities agree that there has been a marked diminution of crop land per capita, even within the present generation. Thus Buck finds that the birth rate in 4,216 farm families

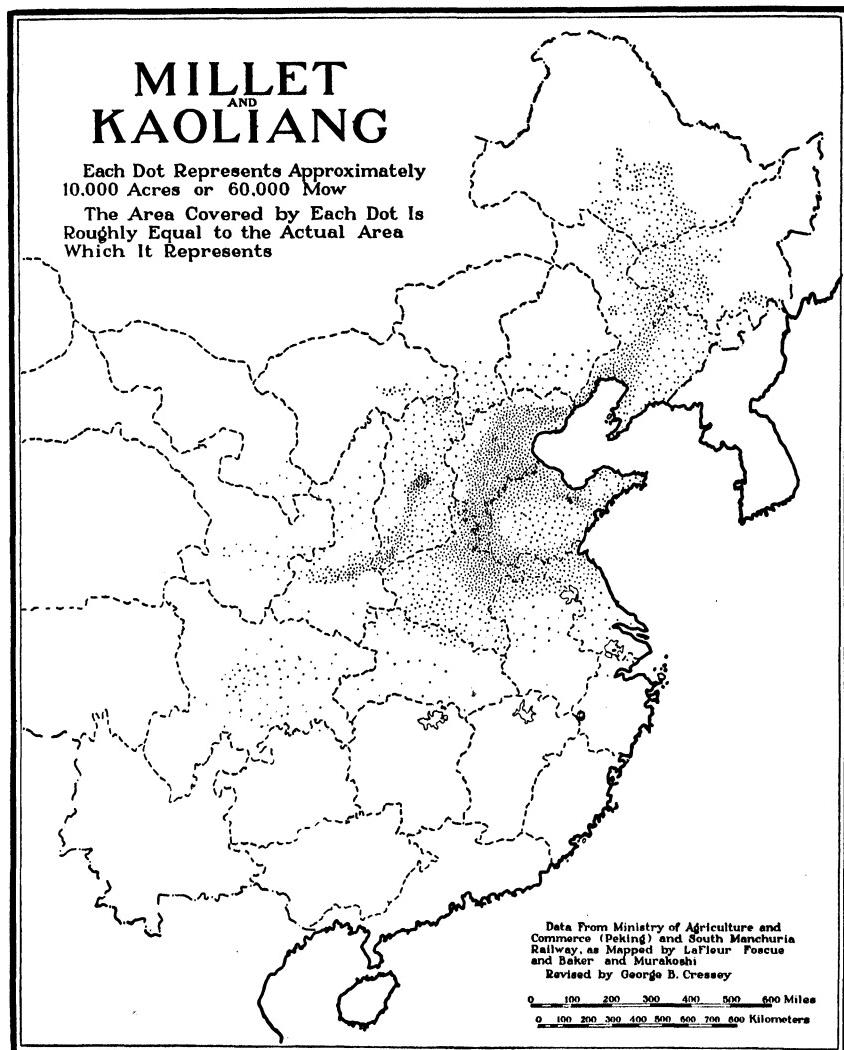


FIG. 48.—Millet and kaoliang are the characteristic crops of the dry North. Their distribution is not always the same, for millet is somewhat more abundant in the northwest and kaoliang is more common in Manchuria.

shows a natural increase which will double the population in 70 years. In the absence of new land, this can only mean decreased holdings.

During the present century, detailed figures have been published by the Ministry of Agriculture and Commerce in Peiping from 1914 to 1921, and by The Directorate of Statistics in Nanking in 1932. These are given by hsien, as well as by provinces, thus making it

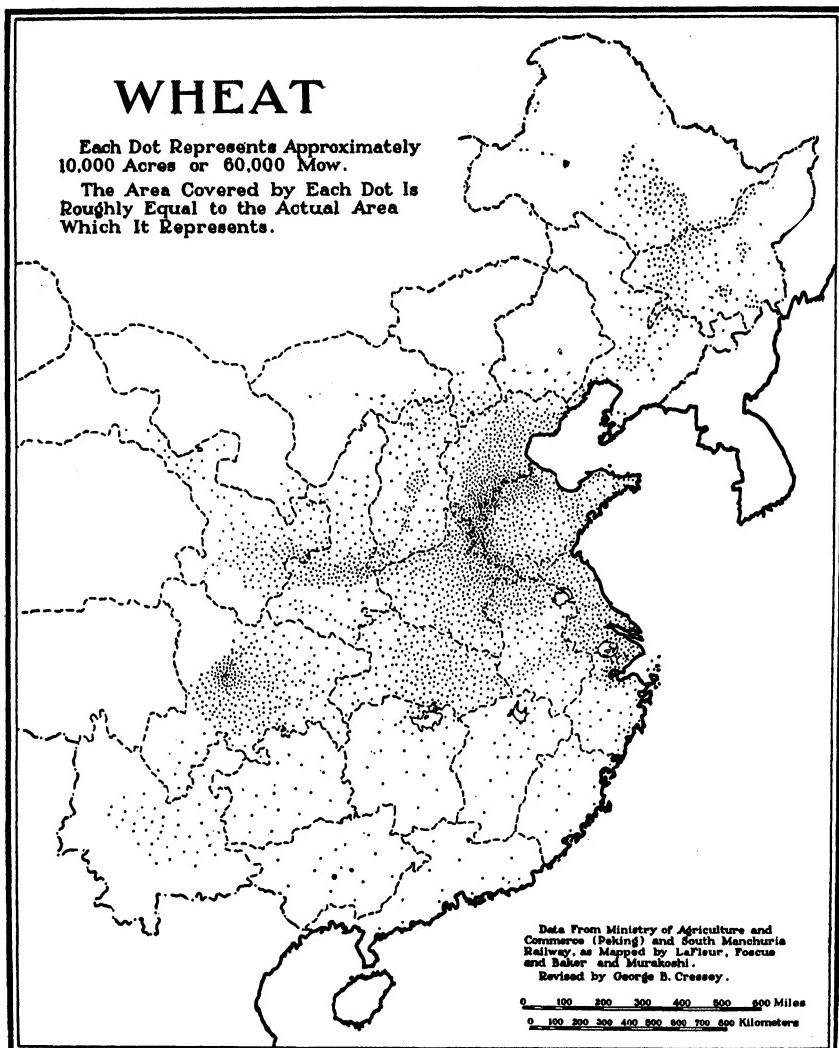


FIG. 49.—Wheat is a northern crop which extends south into the Yangtze Valley.

possible to redistribute the figures by geographical regions. In most years, certain hsien or even provinces are missing. Glaring errors appear in some of the reports of the Peiping Ministry, especially for Shantung and Honan, where individual hsien are credited with cultivated areas larger than the entire surface area of the hsien. Thus 3 hsien in Shantung in 1915 reported crop land nearly equal to that of the remaining 104 hsien. Honan for several years reported farm

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TABLE VI.—FARM LAND BY PROVINCES

Province	Total area farm land, thou-sands of mow (000 omitted)		Percentage of total area in farms, Lieu	Mow of farm land per person, Lieu
	Ministry of Agriculture and Commerce (1914)	Ministry of Agriculture and Commerce, revised by Lieu		
Heilungkiang.....	32,493	36,486		
Kirin.....	43,082	83,253		
Liaoning.....	48,994	44,407		
Jehol.....	15,340	16,243		
Chahar.....	9,766	11,704		
Suiyuan.....	.....	5,525		
Ningsia.....	.....	.....	19.4	3.5
Hopei (Chihli).....	90,432	94,764		
Shansi.....	46,855	49,821		
Shantung.....	219,666	111,800	43.0	3.3
Honan.....	343,495	140,000	44.3	4.2
Shensi.....	30,800	52,500	15.0	3.0
Kansu.....	23,090	26,700	4.6	3.6
Sinkiang.....	10,916	10,700	0.5	4.0
Chinghai.....				
Sikang.....				
Kiangsu.....	85,390	74,000	41.3	2.1
Anhwei.....	28,017	101,900	40.0	5.0
Hupei.....	126,680	154,500	46.5	5.4
Szechwan.....	55,891	152,700	15.0	2.5
Chekiang.....	27,020	50,000	29.3	2.1
Kiangsi.....	34,261	96,900	30.0	3.5
Hunan.....	28,464	135,600	35.0	3.3
Kweichow.....	.....	8,300	2.6	0.7
Yunnan.....	10,456	26,000	3.8	2.3
Fukien.....	16,810	32,300	15.0	2.2
Kwangtung.....	22,592	92,900	20.0	2.5
Kwangsi.....	43,623	78,400	21.9	6.4
Provincial China.....	1,394,146	1,687,300	14.8	3.4

Data from D. K. Lieu and Chen Chung-min, Statistics of Farm Land in China, *Chinese Economic Journal* (March, 1928), 181-213.

land amounting to 110 per cent of the entire area of the province, owing to excessive figures in 3 hsien.

The statistics for 1914 in Tables VI are the unedited figures as given by the Ministry and show a farm area of 1,394,146,000 mow (332,358,000 acres). These returns have been edited by D. K. Lieu,

who has used the average of 1916–1917 where the figures appear complete and reliable and has introduced new estimates where necessary. Despite the necessary reductions in Shantung and Honan and allowing for corrections for the outlying provinces whose reports to the central government have seldom been complete, Lieu's revised estimates place the farm area at 1,687,300,000 mow (281,217,000 acres). The estimates of the Ministry are divided into two categories: farm land in one, and gardens and orchards in the other. Usually the latter is a small figure, but in some provinces there seems to have been a misunderstanding and in Szechwan the area of gardens and orchards exceeds the reported farm land. The figures in the accompanying table refer only to farm land.

The percentage of the total area in farms and the area of farm land per person are of particular interest. For twenty-six provinces, omitting Chinghai and Sikang in Nearer Tibet where cultivation is practically absent, Lieu's figures show that only 14.8 per cent of the country is under cultivation. This percentage is based on an assumption of 4,646.4 mow per square mile; if instead the mow is regarded as being one-sixth of an acre, then the divisor should be 3,840. This is the basis used in this book. The ratio of farm land or cultivation index thus becomes 18 per cent. Such a low figure in the face of the urgent compulsion of an expanding population can only mean that the resources of arable land have been utilized up to the practical limit of the methods available to the Chinese farmer.

The most recent and probably the best agricultural estimates are those published by the Directorate of Statistics of the Nanking Government in 1932 under the direction of C. C. Chang. These figures are based upon reports from local officials, postmasters, and farmers and were collected from 1929 to 1932. There are at present 1,935 hsien in the 28 provinces, and this tabulation covers 1,781 hsien in 25 provinces. The omissions, with the exception of Kwangsi, are in remote areas where cultivation is unimportant. These estimates give a total of 1,248,781,000 mow under cultivation in "average years," equal to 208,130,000 acres. They are shown in tabular form in Table VII.

Statistics were collected for irrigated areas as well as all cultivated land, with the totals showing approximately one-fourth of all crop area under irrigation. Irrigated land is strikingly concentrated south of the Tsingling Shan and the Hwai Ho, where a number of provinces list half of their entire cultivated land as under irrigation. Chang gives no figures for the total area of the provinces, but on the basis of the measurements for the various provinces, as given on page 55,

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TABLE VII.—CULTIVATED LAND AND CROPS BY PROVINCES

Province	Households		Area of cultivated land, thousands of mow (000 omitted)	Percentage of farm households to total	Total	Irrigated	Mow of cultivated land per household	Crop area, thousands of mow (000 omitted)					Province
	Total households	Farm households						Rice	Soy beans	Kao-hang	Millet	Barley	
Heilungkiang ³	624,468	489,927	78.5	50,475	382	103	9,602	116	15,602	8,262	10,152	1,891	2,672
Kirin	1,260,907	941,454	74.7	66,304	1,436	70	9,392	1,945	21,777	15,973	11,974	1,646	3,569
Liaoning.....	2,157,705	1,775,150	82.3	71,961	878	41	2,775	2,158	15,804	24,244	10,466	1,230	9,206
Jehol.....	437,232	347,473	79.9	17,546	240	40	850	136	5,333	5,231	7,250	235	322
Chahar.....	594,067	309,109	78.4	16,839	1,835	54	1,610	158	1,025	1,652	3,350	664	418
Suiyuan.....	367,452	249,727	68.0	18,639	1,400	75	2,679	503	1,997	4,109	974	51	Suiyuan
Ninghsia.....	76,050	54,150	71.3	2,004	1,496	97	503	948	78	2,396	2,396	17	Ninghsia
Hopei.....	4,988,685	4,223,704	85.5	103,432	8,467	24	31,336	601	9,804	21,659	24,330	3,943	15,502
Shansi.....	2,263,408	1,874,082	82.8	60,560	3,629	32	16,530	196	20,910	18,429	2,139	4,065	Shansi
Shantung.....	6,659,858	5,918,230	88.9	110,662	2,395	19	49,688	196	22,239	21,156	3,670	5,983	Shantung
Hunan.....	6,059,066	5,061,700	84.0	112,981	7,809	22	59,598	4,029	14,352	15,439	19,920	10,373	8,696
Shehai.....	1,886,926	1,384,575	73.0	33,496	8,111	24	14,839	2,913	2,904	4,941	8,176	3,772	Shensi
Kansu.....	1,075,860	783,160	73.7	23,510	3,861	30	8,639	449	1,294	1,531	3,554	2,513	1,287
Sinkiang.....	512,316	343,111	67.2	13,692	.....	40	4,710	1,676	149	747	334	626	2,638
Chinghai.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Chinghai
Sikang.....	6,458,036	5,056,536	78.5	91,669	35,571	18	42,197	31,641	16,832	6,736	1,575	22,210	3,926
Kiangsu.....	3,788,764	2,082,348	70.8	53,511	20,830	20	21,295	23,221	8,843	5,052	429	7,140	Kiangsu
Anhwei.....	5,726,373	3,839,600	68.6	61,010	22,724	15	18,748	24,452	5,280	3,659	2,270	10,234	Anhwei
Szechwan.....	7,263,538	4,975,252	68.5	96,277	42,222	19	18,437	45,747	7,599	5,444	984	8,236	12,751
Chekiang.....	4,559,540	3,164,857	69.4	41,209	29,806	13	8,996	27,982	2,920	131	595	4,566	1,105
Kiangsi.....	4,942,549	3,982,310	66.6	41,680	23,680	13	4,589	32,190	4,618	1,422	7,600	2,215	Kiangsi
Kweichow ²	5,557,680	3,889,715	70.4	45,612	28,844	12	3,444	26,390	2,645	1,962	1,465	813	1,984
Yunnan ¹	1,769,023	1,183,488	67.5	23,000	9,513	19	2,645	11,924	2,308	663	691	1,921	Kweichow
Fukien.....	1,947,021	1,383,924	71.1	27,125	12,036	20	4,443	13,655	2,671	718	643	2,047	3,176
Kwangtung.....	2,237,645	1,625,684	71.1	23,290	11,988	14	4,097	16,769	1,639	19	1,039	698	3,888
Kwangsi.....	5,459,096	3,479,103	63.7	42,452	24,630	12	1,199	52,371	1,562	178	340	142	Kwangtung
Total.....	78,568,245	58,569,181	74.5	1,248,781	302,309	21	342,371	321,366	176,528	152,587	160,095	94,749	92,031

¹ Figures for Sinkiang represent only 56 hsien, 10 hsien not included.² Four hsien of Yunnan not included.³ One hsien of Heilungkiang and Kweichow not included.Data from C. C. Chang, Estimates of China's Farms and Crops, *Statistical Monthly* (Nanking), (January–February, 1932).

the reported total of cultivated land is 17 per cent of the area of Provincial China, or very close to Lieu's revised figure.

The area of crop land per farm family is 21 mow, which represents the average size of the farms. If we assume that the average family includes nearly 6 people, there would be about 3.5 mow per farm inhabitant. In order to secure a per capita figure for the entire population, we may multiply the total number of households in China by 6, giving an approximate population of 471 million. The cultivated



FIG. 50.—Carrying live pigs to market may save a pound or two, but it is hard on the farmer. (*Mactavish and Company*.)

land per person thus amounts to only 2.6 mow, or 0.43 acre. Of particular interest is the marked change in farm area per family from north to south. In the pioneer plains of Heilungkiang the figure rises to 103 mow, while in Hopei it drops to 24 mow and in tropical Kwangtung is only 12 mow.

Inasmuch as the primary objective of this book is the presentation of cultural landscapes as they are found in various geographical regions, statistics are organized as far as possible in terms of regions rather than political provinces. In the Statistical Summary (Table XXXVI) the figures of the Ministry of Agriculture and Commerce have been recombined by geographic regions, and all obvious errors, whether too large or too small, have been replaced by the average for the

province. Omissions have likewise been filled. These figures apply to the total area of cultivated land, including that listed as farm land together with such areas as are included under gardens and orchards. It is felt that this is the most satisfactory revision of the original material which is practical. The total does not include outlying areas such as Sinkiang, Mongolia, or Tibet and applies only to that part of the country which may be described as Agricultural China. On this basis, the cultivated area amounts to 1,241,579,368 mow. This study was completed prior to the appearance of the figures of the Directorate of Statistics, which would otherwise have been used. The net difference, however, is thought to be slight.

These figures of actual crop land may be compared with the analysis of O. E. Baker who estimates the ultimate area suitable for cultivation on the basis of climate, land forms, and soils at 700 million acres. It seems probable that Baker has made unwarranted assumptions as to the topographic similarity between China and the United States, and that in other respects as well he has greatly exaggerated the agricultural potentialities of China. His comparison with the United States is nevertheless of interest.¹

"The Chinese Republic has, therefore, about 29 per cent of its land area physically available for crops. In the United States the corresponding proportion is 51 per cent. But as the Chinese Republic has a population of about 440 millions and the United States less than 120 millions, the area of land on which it is physically possible to grow crops is at present 1.6 acres per person in the Chinese Republic and 8.1 acres in the United States. In other words, the United States now has five times as much potential crop land per capita as the Chinese Republic."

A significant comparison may be made between the cultivated area of Agricultural China and that of the United States in 1919. In that year the latter country reported 365 million acres of crop land as compared with approximately 207 million acres in China a few years previously. This represents a per capita average of 3.5 acres in America and 0.4 acre in China.

CROP YIELDS

Most statistics of agricultural production in China are open to criticism on account of the inaccurate methods of collection. It appears probable, however, that the 1932 figures of the Directorate of Statistics.

¹ BAKER, O. E., Agriculture and the Future of China, *Foreign Affairs*, VI (1928), 7

in Nanking represent the best information yet available. This report gives data on area and production for each crop by provinces, which may be used to determine acre yields. The accompanying figures of crop yields given in Table VIII are from this source. In order to supply a check on the acre yields derived from the Nanking statistics, a comparison may be made with the accurate sample surveys of Professor Buck. These covered seventeen localities in northern and east central China and suggest the approximate conditions for the entire country. In most instances Buck's figures are somewhat lower.

TABLE VIII.—CROP YIELDS¹

Product	Production, millions of pounds	Yield per mow, catties	Yield per acre		Yield per acre after Buck, ³ bushels	World yield per acre ⁴
			Pounds	Bushels ²		
Rice.....	130,312	271	2,433	54	51.9	32 bu.
Wheat.....	56,449	124	989	16	14.9	14 bu.
Sweet potatoes	35,745	992	7,497	139	....	(95 bu.)
Kaoliang.....	31,154	159	1,925	22	18.5	
Soy beans.....	30,779	131	1,046	17	12.4	(13.7 bu.)
Millet.....	28,965	144	1,158	21	23.0	
Corn.....	19,704	161	1,284	23	11.9	24 bu.
Barley.....	17,093	135	1,082	28	17.7	20 bu.
Sugar cane.....	6,489	1,577	12,576	....	....	(26,600 lb.)
Peanuts.....	5,843	249	2,009	....	....	(669 lb.)
Irish potatoes..	5,393	751	6,005	100	....	143 bu.
Cotton.....	2,171	25	204	....	....	161 lb.
Rape seed....	1,543	106	847	....	24.4	482 lb.
Tobacco.....	464	161	1,288	....	....	776 lb.

¹ Derived from data in *The Statistical Monthly* (Nanking), (January-February, 1932), 2-4, except as in footnotes 3 and 4.

² A bushel is figured as 60 lb. of wheat, soy beans, and Irish potatoes, 56 lb. of kaoliang, millet, and corn, 54 lb. of sweet potatoes, 48 lb. of barley, and 45 lb. of rough rice.

³ BUCK, J. LOSING, "Chinese Farm Economy," 204. Average of 2,866 farms in seven provinces of North and East Central China.

⁴ Prewar averages from "International Yearbook of Agriculture, 1930-1931." Figures in parentheses are not available on a world basis and are United States averages from "United States Yearbook of Agriculture, 1930."

On the basis of the incomplete reports of the former Peiping Ministry of Agriculture and Commerce, O. E. Baker¹ concluded that China's average acre yields of five cereals were 20 per cent lower than in the United States. He therefore postulated a considerably larger

¹ BAKER, O. E., Land Utilization in China, in "Problems of the Pacific, Honolulu, 1927," 337.

potential crop yield with more efficient agriculture. This comparison does not appear in these newer figures, for China exceeds American averages in everything but corn and Irish potatoes and is likewise considerably above the level of world yields.

(China probably leads the world in total cereal production. The country appears to hold first place among all nations in rice, wheat, sweet potatoes, kaoliang, soy beans, millet, barley, peanuts, tea and silk. Despite the importance of agriculture, China fails to produce enough food to feed her own population and each year imports large quantities of sugar, rice, and wheat.)

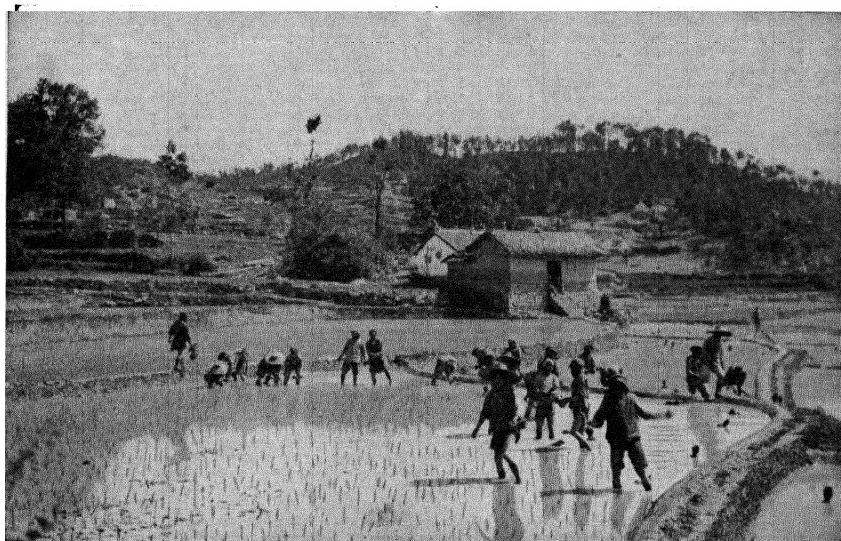


FIG. 51.—Every blade of rice in China is set out by hand. This scene is in Szechuan.
(E. H. Wilson, courtesy Arnold Arboretum.)

Rice is the outstanding agricultural product and forms the staple food for the people of South China. Although rice will mature as far north as Vladivostok, only limited quantities are raised north of the Tsinling Range and the Hwai Ho. Tsingkiangpu and Hwaian in northern Kiangsu are the limits of extensive cultivation. Small areas of rice are found near Tsinan in Shantung, around the Summer Palace at Peiping, south of Taiyuan in Shansi, and in irrigated oases of the northwest. Rice has also been introduced into Manchuria by Korean colonists.

The comparative absence of rice in the North is due partially to the sandy soil and the scarcity of water for irrigation but also to custom. Rice can be grown without flooding, but the yield is small and

or flour is imported to both North and South China from Canada and the United States. Wheat yields approximate those of the United States but are less than half those of Western Europe. On the basis of the Nanking statistics, China appears to have a slight lead over the United States and Russia in total production.

Millet and the grain sorghum kaoliang take the place of rice in the dry North and are grown as summer crops. Although their distribution is quite similar, the growing plants have little in common. Fields of millet grow three or four feet high and are not unlike barley or oats, while kaoliang resembles tall corn. These grains are used as a food for both man and domestic animals.

Soy beans are the magic crop of Chinese agriculture. Although they have been grown throughout China on a small scale for many centuries, it is only in recent years that their manifold uses have been appreciated. They now form one of the largest items in China's foreign trade, with Manchuria as the chief producing area. The export consists of beans, bean cake, and oil. In foreign countries the bean oil is used in a great variety of industrial processes and the cake serves as a fertilizer or as a feed for cattle. In China soy beans are used in the preparation of cooking oil, bean curd, and other foods. Many other varieties of legumes are also raised.

Detailed consideration of these and other crops will be found in the chapters on various regions. Thus tea is discussed under the South Yangtze Hills, silk in the Yangtze Plain, cotton in the North China Plain, Yangtze Plain, and elsewhere, beans in Manchuria, and rice in the Yangtze Plain.

CHINA'S AGRICULTURAL PROBLEMS

There is an old Chinese proverb which says, "To learn to be a farmer one need not study, one needs only to do as his neighbor does." Conservative adherence to the empirical methods of past generations has played too large a rôle. Coupled with this inertia has been a widespread individualism and a lack of cooperation which has held back community progress. Farms are so small and families so large that risky experimentation is avoided, and capital is not available for improvements.

Oriental agriculture has been widely heralded as intensive and efficient. In terms of acre yields this may be true. Such productivity, however, is the result of a laborious cultivation which is very wasteful of human effort. Excessive amounts of time and care are bestowed upon tiny scattered fields, and the commendable production is secured

only at the expense of a small per capita farm area. After all, it is not the yield per mow but the yield per mouth that counts.

Most of China is an old land of stabilized agriculture with the soil cultivated so near to the economic limit that larger crop yields are difficult to secure. Pioneering possibilities are present only in the far north and northwest and even in these areas are distinctly limited. Some expansion of crop land may be possible through the drainage of swamps and the irrigation of new lands, both in the semiarid north and on the hill slopes of the south. Commercial fertilizers and mechanical or animal power on the farm would assist but may not be financially feasible. Better seeds and improved farm management will

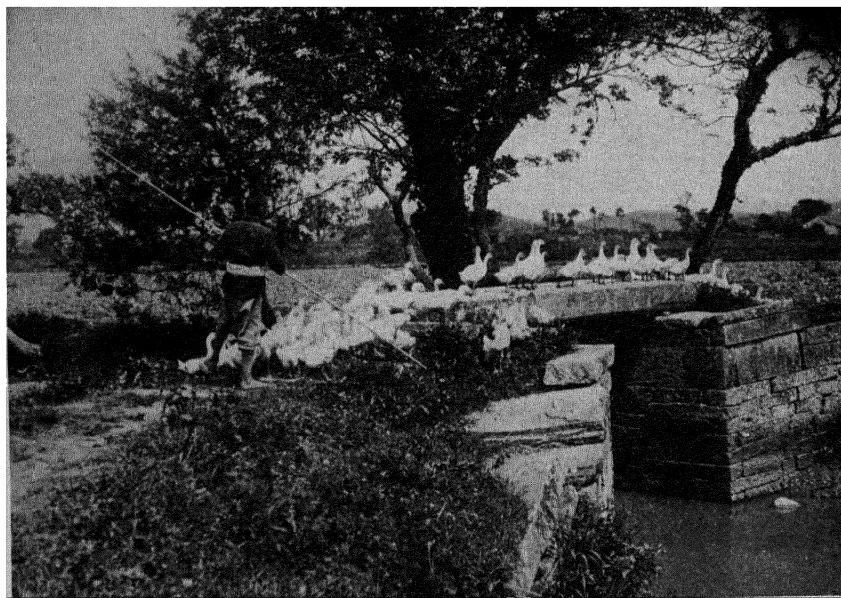


FIG. 53.—The flocks of ducks found along many canals are reminders that no source of food is overlooked. (*Mactavish and Company*.)

contribute materially and probably hold the most significant promise of improvement in general livelihood. None of these possibilities, however, appears to offer an opportunity for adequate expansion. China's major problem is either to reduce radically the population or to increase production several fold.

Few agriculturalists have traveled as widely throughout China as Paul O. Nyhus of the United States Department of Agriculture. His conclusions are thus of special significance.¹

¹ NYHUS, PAUL O., "Cropping Systems and Regional Agriculture in China," 9-10.

"The writer is aware of so many instances from Mongolia to Yunnan where the possibility of the land to yield even a meager food supply is not being neglected that he is of the opinion that in China Proper population pressure and attendant conditions of incredibly meager standards of living and low wages have quite completely taken up the land capable of yielding a food supply."

Manchuria still contains some good unoccupied farm land but the pioneer fringe in the northwestern provinces is strictly limited by drought and "the potentiality of the land to carry a larger population is very doubtful."¹

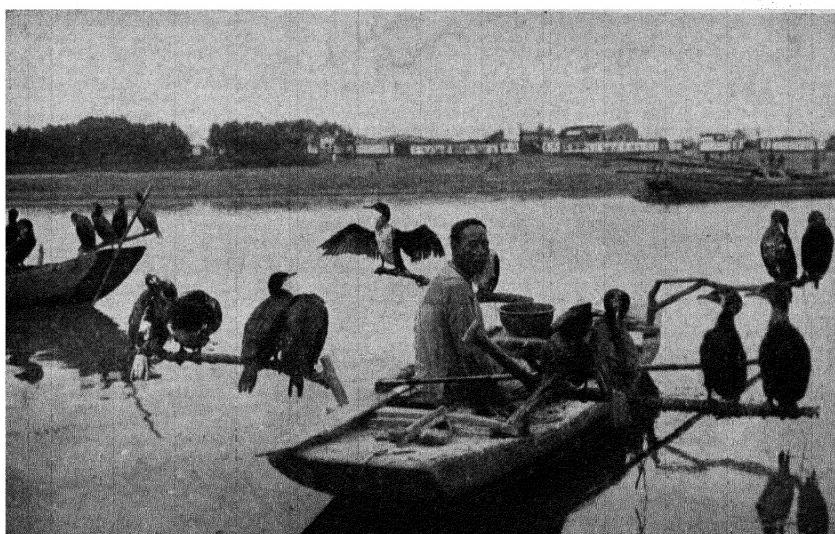


FIG. 54.—Cormorant fishing near Peiping. Before the birds dive for fish, a ring is placed around their neck to prevent swallowing the catch. (*American Museum of National History.*)

The work of Buck likewise emphasizes the low standards of living and the difficulty of solving the farm problem on a nation-wide scale. He points out that the meager farm income is largely devoted to the necessities for bare existence, with little margin for health, education, recreation, or community development. This condition is closely associated with the small size of the farms and in turn is related to the high density of the farming population.²

"The remedies for this too small size of farm business are difficult to find. Colonization seems scarcely the solution, since

¹ NYHUS, PAUL O., "Cropping Systems and Regional Agricultural in China," 10.

² BUCK, JOHN LOSSING, "Chinese Farm Economy," 424.

lands for such extensive colonization as would be needed are limited, even in Manchuria and the Northwest. Moreover, unless something is done to check the growth of population, colonization will do little permanent good. The same may be said of drawing men from the land to industry. As China becomes modernized, it is inevitable that industries will develop and a certain number of the country people be absorbed into them. Yet it can scarcely be hoped that sufficient numbers of them will be so absorbed as to relieve the present agricultural situation very much. The best future solution of the problem seems to be in some method of population control, and the best immediate solution, more intensive methods of raising crops and the growing of crops that produce more food per unit of land. Such productivity, however, will also be useless if population continues to grow."

The pattern of China's agricultural life is changing. Transportation by rail and river steamer is opening interior markets and displacing the old local farm and industrial organization. The farmer is beginning to find himself in a new social and economic order where his present methods, however adequate for his ancestors, are no longer in adjustment with his new world neighbors. The cloth, baskets, and shoes which were once made in spare moments on the farm are now produced in the cities. The peanuts, eggs, and cotton which once did not travel beyond the nearest market village are now exported to foreign countries whose names the producer does not even know. Education and social changes are slowly bringing new ideals and wants.

The transition between old and new will doubtless continue for some decades. In many instances it will bring distress with resulting political confusion. On the basis of China's apparent resources it seems probable that agriculture, rather than industry, will continue to remain the backbone of the national life. Scientific farming, engineering skill, and orderly government can do much to help, but the outstanding problem seems to be that China has too many people—not too many, perhaps, for bare subsistence, but certainly too many for a standard of living comparable to that of agricultural Europe. Behind the crowded farms and surplus millions lie social ideals which need to be most carefully scrutinized, and social changes require time.

CHAPTER V

NATURE'S GIFTS TO CHINA

THE HISTORICAL BACKGROUND

When Marco Polo returned to Venice from his travels in China seven centuries ago, he brought back an amazing account of life in far Cathay. The China which he visited was in many respects quite the equal, and in some ways the superior, of Europe of the thirteenth century. Particularly was this true with regard to the use of metals, for the Chinese had long known the arts of metallurgy. Marco Polo also related strange stories of the way in which the Chinese caused black stones to burn.

As a result of the travels of various early explorers, a certain mystic uncertainty came to be associated with the Orient. The early trade which passed from the East to the West consisted of silks, gems, porcelain, and similar articles of high value combined with small bulk, and it was but natural to assume that they came from a land of wealth. It was the lure of this trade which sent the Arabs to China by sea and led the Portuguese to search for a passage around Africa to India and later to China. Even the voyage of Columbus was but another phase of this quest for an easy route to Cathay.

The mineral industry has had a long history in China. Metallic coins were used during the Chou dynasty, and coal is referred to in the history of the Han dynasty, 206 B.C. to 251 A.D., as a kind of stone which could be burned like brushwood. Following the Han dynasty, governmental restrictions and growing superstitions as to disturbing the ground resulted in a decline in mining until the Sung dynasty, 960 to 1127 A.D.

During the reign of the Emperor Kang Hsi (1662 to 1722) copper and lead mines were permitted on the payment of a 20 per cent tax, and by the time of Chien Lung (1736 to 1794) mining was an important industry with thousands of pounds of copper contributed annually to the court at Peking from Yunnan and Szechwan. The first attempt at modern mining was in 1878 when Li Hung-chang, then Governor of Chihli, organized the Kaiping Mining Bureau which was the forerunner of the present Kailan mines.

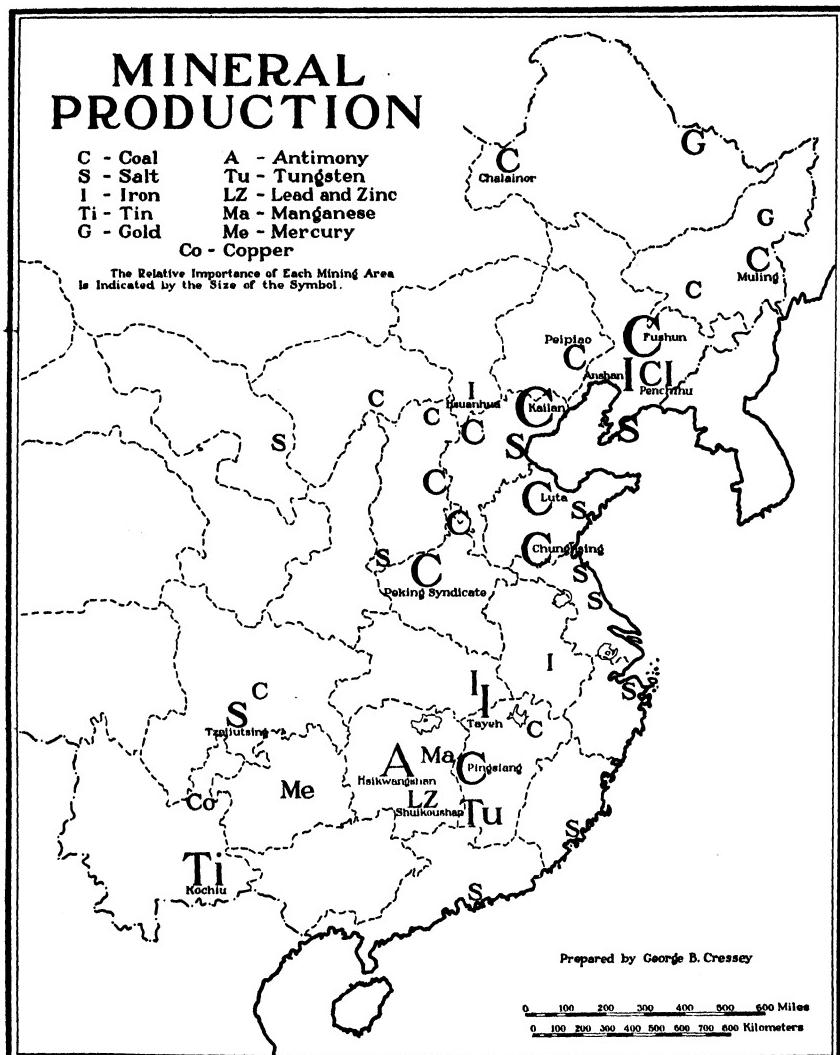


FIG. 55.—The distribution of mineral production. The approximate value of the normal output is indicated by the size of the symbols.

Side by side with this development of mining has been a deep-seated semireligious fear that digging into the earth would disturb the spirits of the ancestors or release hidden forces of evil. This superstition is known as *feng shui*.

Since the days of the first European travelers, popular imagination has continued to picture the Middle Kingdom as a land of exceptional

mineral wealth. These vague impressions received their first scientific confirmation from the writings of Baron Ferdinand von Richthofen who traveled extensively throughout China in the years following 1870 and noticed the large number of small mines. In his letters he described in enthusiastic terms the vast deposits of coal and iron, particularly in Shansi, which he declared were enough to supply the entire world for many centuries! Few statements about China have been more widely quoted than this.

Despite the fact that von Richthofen was an eminent geologist and is properly called the father of Chinese geology, he fell into the common error of interpreting widespread occurrence to mean abundance. Unfortunately he was incorrect, particularly as to the reserves of iron ore. Experience has since shown that the ore bodies and mineral deposits of China are too often of limited area and are quickly exhausted.

Since the establishment of the Republic in 1911, systematic geological surveys have been carried on by the central government and by several of the provinces. The National Geological Survey was organized at Peiping in 1916, and most of north and east central China has now been covered by reconnaissance surveys. In addition to the work of the government itself, extensive investigations have been made by various corporations operating under concessions from the central or provincial governments.

It is thus quite incorrect to assume that China is a new and unexplored country geologically. The chief metals have been recognized and mined since early times. Careful studies have been made of the historical records, and all places where mining has been carried on at one time or another have been investigated. Reconnaissance surveys have shown those sections where it is futile to expect coal or petroleum and have likewise indicated the areas where ores may be expected to occur. Further work will greatly enlarge our knowledge as to the extent and characteristics of many deposits, but it will probably not affect the main outlines of our present knowledge. This situation applies particularly to the common metals long known to the Chinese rather than to special varieties, such as antimony, for which no need existed in the past.

The future material prosperity of China is directly linked with her natural resources. The great industrial development forecasted by some prophets is strictly conditioned upon the presence in accessible areas of the needed basic materials. Without coal and oil for power, iron and copper for construction, limestone for cement and as a flux, and sulphur for sulphuric acid, a nation is distinctly handicapped in

this modern age. It has often been vaguely assumed that China was bountifully supplied with all of these, and it will come as a surprise to many to learn that her supplies of oil, iron, copper, and probably sulphur are distinctly limited. Enormous stores of coal are present and there is no lack of limestone, but in the absence of iron it is difficult to see how industry can develop.

It is now clearly evident that China is not highly mineralized, and her world rank is that of a minor nation. The available reserves are such that a great development may take place compared with the present, but there seems little possibility that China will ever rival the industrial areas of Eastern North America or Western Europe.

COAL, THE GREATEST SOURCE OF ENERGY

Resources of coal form the key to industrial supremacy, and the political distribution of the world's supply is a vital matter. In 1913 the Twelfth International Geological Congress meeting at Toronto, Canada, published information as to the coal reserves of the entire world. No estimate can be strictly accurate, but the relative simplicity which characterizes coal beds enables satisfactory forecasts to be made for most countries. Considerable uncertainty exists, however, as to just what is meant by "reserves." It is not enough to estimate the total quantity irrespective of possible utilization, for coal which is too deeply buried or too thin or too poor in quality is not worth mining. It does not seem likely in the near future that it will ordinarily be profitable to mine beds with a thickness of less than 3 ft. at depths greater than 3,000 ft. Some of the estimates of the Congress were prepared on more optimistic bases and represent the maximum known reserves. Certain of the estimated reserves are shown in Table IX, with modifications for the new boundaries in Europe.

TABLE IX.—COAL RESERVES OF THE WORLD

Country	Millions of metric tons (000,000 omitted)
United States.....	3,838,657
Canada.....	1,234,269
China.....	996,613
Siberia.....	173,879
Australia.....	165,572
Japan.....	7,970
United Kingdom.....	189,533
Germany.....	148,217
France.....	18,573
All others.....	624,270
World total.....	7,397,553

Of the countries around the western margin of the Pacific, China appears to have by far the largest supplies, although both Siberia and Australia possess high-grade deposits. Japan is conspicuously poor, although the advantageous location of her coal near tidewater has made it possible for her to become an important exporter.

The greatest uncertainty in these estimates concerns the figures for China, which were presented to the Congress by Drake, an American geologist and mining engineer long resident in China, and Inoyue, director of the Imperial Geological Survey of Japan. Each made a separate report and their figures differed widely.

The rosy predictions of von Richthofen and Drake received a sudden blow with the publication of the first official estimate of the Geological Survey of China in 1921, prepared by V. K. Ting and W. H. Wong. This estimate made generous allowances for little-known fields, but the total of probable reserves amounted to only 23,435 million tons. Allowing for thinner beds and greater depths, the possible reserves were thought to be from 40,000 to 50,000 million tons. While this estimate was admittedly conservative and preliminary, it fell far short of expectations and carried serious implications as to the future industrialization of China. Fortunately these figures have now been superseded by more complete data and the trend of prediction is upward.

The latest estimates of the Geological Survey are those of W. H. Wong and T. F. Hou in the fourth edition of the "General Statement on the Mining Industry" issued in 1932. These provide detailed reports for twenty-three provinces where the coal fields have been individually surveyed plus rough guesses for Kansu with Ningsia and Sinkiang where geological studies are not available. These estimates give a total of 246,081 million metric tons, of which one-sixth is anthracite and most of the rest bituminous. Detailed figures of various authorities are given in Table X.

The chief uncertainty at present concerns the reserves of the northwestern provinces where certain reconnaissance surveys suggest deposits much larger than the estimates of the Geological Survey. Thus Fuller and Clapp, two American petroleum geologists who with their associates have traveled over 10,000 miles in the region, give estimates of 210,000 million tons for western Shansi and 157,000 million tons for Shensi. To this may be added Drake's estimates of probable reserves in eastern Shansi of 360,000 million metric tons. That these larger figures are to be given consideration is shown by Bain's statement in the 1933 revision of his "Ores and Industries in the Far East,"¹

¹ BAIN, H. FOSTER, "Ores and Industry in the Far East," 58.

TABLE X.—ESTIMATED RESERVES OF COAL
(In millions of metric tons, except as otherwise indicated, 000,000 omitted)

Province	Richto- ten (1877), short tons?	Willis (1908), short tons	Drake (1912)		Inouye (1912) probable reserve	Haieh (1925) probable reserve	Ting and Wong (1921) probable reserve		Fuller and Clapp (1926-1927) recoverable, short tons		Wong and Hou (1932) probable reserve		Total	Province
			Probable reserve	Possible reserve			Anthra- cite	Bitu- minous	Lignite					
Anhwei.....	.....	.....	187	.....	205	358	.....	.....	.....	60	387	.....	347	Anhwei
Chahar.....	.....	.....	96	120	120	120	.....	.....	.....	17	487	.....	364	Chahar
Chekiang.....	.....	.....	25	80	150	150	.....	.....	.....	20	81	.....	101	Chekiang
Chungking.....	.....	.....	9,275	200	160	160	.....	.....	.....	351	149	.....	500	Chungking
Fukien.....	.....	.....	2,068	3,080	1,765	7,449	.....	.....	.....	6	619	392	1,017	Fukien
Heilungkiang.....	.....	.....	22,668	2,970	2,970	2,898	.....	.....	.....	4,630	1,994	.....	6,624	Heilungkiang
Hunan.....	5,000	18,276	90,000	17,000	1,600	6,000	.....	.....	.....	981	2,088	.....	8,071	Hunan
Hupei.....	.....	.....	117	.....	130	448	.....	.....	.....	455	1,588	.....	1,738	Hupei
Jehol.....	.....	.....	5,129	.....	.....	660	.....	.....	.....	160	380	.....	440	Jehol
Kansu†.....	.....	.....	3,935	1,435	1,000	500	15,000	.....	.....	2	573	39	6,000§	Kansu†
Kiangsu.....	325	.....	10	.....	190	195	.....	.....	.....	204	765	.....	217	Kiangsu
Kirin.....	.....	.....	.....	7	160	1,298	.....	.....	.....	25	192	.....	1,145	Kirin
Kwangsi.....	.....	.....	500	.....	500	500	.....	.....	.....	150	986	.....	960	Kwangsi
Kwangtung.....	498	1,009	30,000	.....	900	500	.....	.....	.....	150	550	.....	571	Kwangtung
Kweichow.....	.....	.....	.....	1,202	1,202	1,285	.....	.....	.....	774	1,539	.....	1,539	Kweichow
Liaoning.....	1,260,000	450,000	363,060	714,340	.....	5,830	127,115	.....	.....	187	1,849	.....	1,836	Liaoning
Ningsia.....	630,000	350,000	360,000	450,000*	240,000*	.....	.....	.....	.....	36,471	87,385	2,671	127,127	Ningsia
Shansi.....	100,000	3,060	4,202	7,083	1,200	.....	.....	.....	210,000	.....	.....	.....	.....	Shansi
West.....	630,000	10,000	10,000	1,050	650	665	2,550	.....	.....	26	1,613	.....	1,639	West
North.....	.....	.....	.....	.....	.....	1,000	6,908	157,000	.....	750	71,200	.....	71,930	North
Shantung.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,000§	Shantung
Shensi.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	417	Sinkiang
Sinkiang.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	58	337	22	9,874	Sinkiang
Suiyan.....	.....	.....	.....	.....	1,200	460†	.....	.....	.....	64	9,810	131	1,627	Suiyan
Szechwan.....	.....	.....	.....	80,500	15,000	1,500	19,000	.....	.....	11	1,385	.....	1,385	Szechwan
Yunnan.....	.....	.....	.....	30,100	.....	1,200	19,000	.....	.....	.....	.....	.....	.....	Yunnan
Total.....	“Very, great”	381,361	906,613	39,974	23,435	217,646	.....	.....	.....	45,455	185,214	3,412	246,081	Total

* Possible reserve.

† Including Ninghsia.

‡ Rough approximation.

"It may . . . be taken as reasonably certain that China as a whole holds one of the great coal reserves. It will probably not lead to great error if for present purposes Drake's general estimate be accepted as being of the right order, however it may be out in particular details." Any figures in excess of the Survey's current estimates, however, should be considered as possible rather than probable reserves.

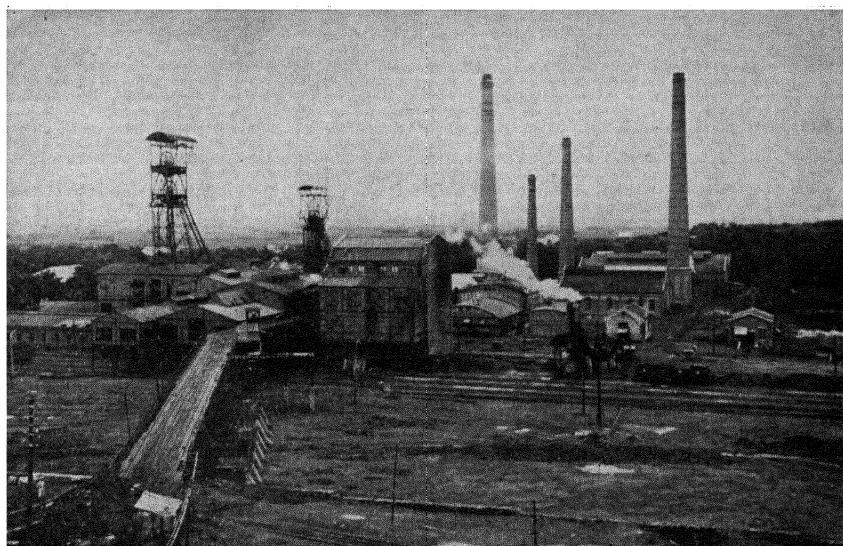


FIG. 56.—China now has a score of thoroughly modern coal mines. This is the Tzuchwan Colliery in Shantung, started by the Germans prior to the World War. (*Atto Photographic Association.*)

(The geographical distribution of China's coal is especially significant. Almost every province has some coal, although there are only small amounts in Chekiang and Kiangsu. The most striking feature is the enormous concentration in the provinces of Shansi, Shensi, Kansu, and Honan. Nearly 90 per cent of China's apparent reserve is thus in the Loess Highlands, and the region will some day become the seat of a great mining industry. There are probably but two other areas in the world with a similar wealth of coal, the Appalachian region of the eastern United States and the lower Rhine valley in Germany, Belgium, and France.

The second coal district of China lies in the Red Basin and the Southwestern Tableland where there is a combined reserve of 13,000 million tons. All the rest of China appears to have but 21,000 million tons put together, a quantity which gives only a very modest per capita reserve for the people who live in these sections.

It should be pointed out that the great bulk of China's coal lies in the midst of mountains in the northwestern and southwestern corners of the country, remote from water transportation and poorly situated with regard to the centers of population and the chief metallic deposits. The development of coal mining will also be handicapped by the shortage of timber for mine purposes.

The world's annual production of coal averages nearly 1,500 million metric tons, of which about three-fourths is mined in the United States, England, and Germany. The Chinese production usually exceeds 25 million tons, while Japan averages 35 million tons. India, with nearly 35 million, Australia and New Zealand with 15 million together, and a small output in Siberia complete the list of Oriental producers.

The principal coal mines of China bear little relation to the location of the largest deposits but are situated along railway lines or near water transportation and have developed in response to market demands. The railroads and steamships are large consumers of coal, and other markets are found in the industrial centers of Shanghai, Hankow, Hongkong, Tientsin, Peiping, Canton, Dairen, and Tsingtao.

TABLE XI.—COAL PRODUCTION BY MINES
(In tons)

Mine	Province	1928	1929	1930
Fushun.....	Liaoning	6,844,300	6,785,000	6,864,100
Kailan.....	Hopei	4,958,000	5,000,000	5,327,340
Penchihu.....	Liaoning	486,000	521,000	582,000
Luta.....	Shantung	616,422	341,920	400,000
Peipiao.....	Jehol	367,010	452,530	509,872
Chinghsing.....	Hopei	268,140	450,000	600,000
Liuhekou.....	Honan	382,300	450,000	500,000
Chungyuan.....	Honan	311,000	216,030	400,000
Mulin.....	Kirin	281,040	350,000	322,600
Chalainor (lignite).....	Heilungkiang	269,400	186,490	5,800
Sian.....	Liaoning	100,000	100,000	385,646
Chunghsing.....	Shantung	.....	102,650	300,000
Pinghsiang.....	Kiangsi		(1924—648,527)	
Peking Syndicate.....	Honan		(1924—670,833)	
Total.....		25,000,000	Increase	Increase

Data from Wong Wen-hao, "The China Year Book, 1931-32."

Statistics for the leading mines as published by the Geological Survey of China are shown in Table XI. Production has fluctuated widely on account of military disturbances, interruptions to transportation, labor troubles, and excessive taxation. In addition to these

modern mines there is an estimated output from small native mines amounting to six to seven million tons per year. About three million tons are imported annually, from Japan and Indo-China, but this amount is approximately balanced by exports, chiefly from Manchuria.

In addition to the official Survey figures of something over twenty-five million tons, estimates prepared in 1929 by Boris P. Torgasheff,¹ a Russian mining economist long resident in China, place the total consumption of coal at 37,890,000 tons, distributed as follows:

	Tons
Household, interior	9,990,000
" , main cities	3,000,000
Industry, modern	15,000,000
" , native	2,000,000
Railroads.	2,500,000
Ships.	3,000,000
At mines.	2,400,000
Total	37,890,000

The present per capita output amounts to about 100 lb. per year. This compares with approximately 1,000 lb. per person in Japan, 10,000 lb. per person in the United States, and 12,000 lb. in the United Kingdom.

Since China's ultimate coal supply is enormous, amounting to over a million pounds per person, it is clear that there is enough to last for a very long period of time. It is quite probable that the rate of use will increase greatly before the end of the century, but on any basis of prediction China may use all the coal which she wishes for several centuries.

OTHER SOURCES OF ENERGY

China's forest resources are limited and are confined to remote areas such as the far northeast or the mountainous tracts of the southwest. Charcoal is used for fuel in some districts and many farmers cut brush from unused hillsides. Rice or wheat straw and kaoliang stalks are in widespread use for kitchen fires. Grain is often pulled rather than being cut, so that even the roots may be burned.

Water power is almost completely undeveloped. Most of the rivers of North China have too variable a flow to make them practical for hydroelectric use, but in the South there are many power sites which may be used in the future. The largest source of water power lies in

¹ TORGASHEFF, BORIS P., "Coal, Iron and Oil in the Far East."

the Yangtze gorges and in the Tibetan Borderland, but the utilization of rivers in these areas must await future developments. Simple mills for grinding grain or water wheels for lifting irrigation water are now the chief examples of power from streams.

Petroleum is the magic fluid of the twentieth century. Through its use man has been able to develop the automobile and to conquer the air, and the lubricants and by-products obtained from crude oil are essential to modern industry.

The location of petroliferous areas is a much more complex geological problem than the mapping of coal beds. In a country the size of China it is quite possible that present surveys have overlooked important oil regions. Despite extensive search, however, no commercial supplies have yet been discovered. Millions of dollars have been invested in the search for oil in China, but each survey has ended in poor or negative results. There are three districts where a small output of oil or gas is obtained by simple methods, but in no case is the yield significant. These localities are in northern Shensi, central Szechwan, and northwestern Kansu. Yenchang in Shensi has the only modern distillation plant, but the 1930 production of crude oil amounted to only 400 tons.

Large areas of China are underlaid by ancient hard rocks in which there is no possibility of finding oil. Elsewhere the nature of the formations and their structure are such that oil is very unlikely. Although oil has an origin distinct from that of coal, it has been demonstrated that in regions where the ratio of fixed carbon in associated coals exceeds 60 per cent oil is rarely present. This relationship is due to the fact that the same forces of regional metamorphism which have driven out the volatile elements from the coal have also produced a natural distillation of any oil which may have been present. Much of China's coal is anthracite or high-grade bituminous with a carbon ratio of over 60 per cent, so that, even without detailed field search, the likelihood of petroleum is poor.

Oil shales from which petroleum products may be secured by distillation are found in several provinces. The cost of recovery, however, is usually such that the resulting gasoline or fuel oil costs more than that obtained from crude oil. The best known deposits are those at the Fushun coal mine in Liaoning where an attempt is being made to secure oil for the use of the Japanese Navy. The Fushun shale contains less than 10 per cent of oil. Similar shales are known in Jehol with an oil content of over 12 per cent. The 1930 production of oil shale at Fushun amounted to 981,000 tons, with a crude-oil yield of 47,815 tons, indicating an actual yield of under 5 per cent.

All available evidence indicates that China is very deficient in oil. One may hope that sources will be discovered in the future, but such a hope has no basis in the facts now known. This deficiency may not be so serious as formerly anticipated, for commercial methods of obtaining gasoline from coal are available and China may in the future obtain her liquid fuel from her coal supplies.

IRON, THE FABRIC OF MATERIAL CIVILIZATION

Small deposits of iron ore are found in many provinces, but most of the occurrences are limited in extent and of poor quality. On the basis of the known geological evidence, it appears that China as a whole is distinctly deficient in reserves of iron ore. This shortage is one of China's most serious mineral problems.

The iron ore of China is of four types: contact metamorphic ores along the Yangtze, sedimentary oolitic ores near Peiping, siliceous Archean ores in Manchuria, and other sedimentary ores in Shansi. Along the Yangtze Valley from Kiangsu through Anhwei to Hupei are several deposits of excellent ore formed by contact metamorphism and usually associated with igneous intrusions. This group forms the most important class of iron ore in China. The deposits vary in size but in several cases are of considerable magnitude. The most noteworthy occurrence is at Tayeh in Hupei where there is a large production of ore which ranges from 60 to 66 per cent iron, both hematite and magnetite being present. Smaller deposits of this type of ore are also found in Honan, Shantung, and other provinces. Since ores formed by contact metamorphism are usually resistant to weathering, they commonly outcrop prominently and form hills, so that it is unlikely that large deposits have been overlooked.

A second type of ore is that found northwest of Peiping in the vicinity of Hsuanhua where high-grade sedimentary deposits of hematite have been discovered in a number of localities. These formations belong to the basal Paleozoic. The known reserves are somewhat less than those of the contact metamorphic type, but geologic conditions are such that other large bodies may still be undiscovered. Some mining was undertaken during the World War but was stopped when prices declined after the war.

The largest iron-ore reserves consist of low-grade hematite deposits which are found in ancient Archean rocks. Large quantities of these ores are exposed in southern Liaoning, northeastern Hopei, and Jehol. Despite the great volume of ore which is thought to be present, the value of the deposits is uncertain. Most of the Archean ore is low in iron and high in objectionable impurities, such as silica. In even the

better ore bodies the iron percentage seldom averages over 40, although thin beds may be richer. Large blocks of ore have been included in the estimates which would not be classed as ore at all in other countries, for the metallic content is too low for profitable operation.

The chief development is at Anshan, south of Mukden. It is necessary to concentrate the ores prior to reduction, and this process adds to the cost and makes it difficult for the Manchurian product to compete with imported iron. The portions of the Archean ores with an iron content of over 50 per cent are so small that there is little likelihood that this region will ever become a major producing district, although it may in time be an important source for the Far East.

The deposits which so greatly impressed von Richthofen are the sedimentary hematite, limonite, and carbonate ores in Shansi. These are widespread but thin and for the most part only workable on a small scale. Detailed geological investigations have almost eliminated them from commercial consideration.

The following table presents the known iron-ore resources of China as compiled by Tegengren for the National Geological Survey and represents the most complete survey yet made.

TABLE XII.—IRON-ORE RESERVES

Type	Average percentage iron	Actual reserves, tons	Potential reserves, tons
Archean ores.....	34.9	295,000,000	477,000,000
Oolitic sedimentary ores.....	50.4	28,000,000	64,000,000
Contact metamorphic ores.....	55.3	73,000,000	9,600,000
Other types.....	.....	.....	5,100,000
Total.....	.....	396,000,000	555,700,000

These figures, representing a total of nearly a billion tons of ore, or 365 million tons of iron, can be appreciated only if seen against the background of world reserves and Chinese consumption. This relationship is well summarized by Tegengren:¹

"It is at once evident that some 950,000,000 tons of iron-ore reserves is by no means much for such a large and populous country as China, and even if continued investigations would—which seems rather improbable—in the near future raise these known reserves to double the amount the general situation would not be essentially altered. One thing, therefore, is certain; China can

¹ TEGENGREN, F. R., "The Iron Ore Deposits and Iron Industry of China," II, 293.

no longer be regarded as a storehouse of inexhaustible future reserves of iron ore, to be drawn upon when the supplies of other countries are beginning to give out. On the contrary, her iron-ore resources must be termed very modest or even scant, when her potentialities of industrial development are taken into consideration, and the strictest economy would be indispensable to guard against future unpleasant contingencies. By way of illustration it may be pointed out that the total quantity of iron-ore (both actual and potential) represented by the figures above would be consumed by the iron industry of the United States within less than nine years. And then it has to be noted that the bulk of these reserves consist of low-grade Manchurian ores, the exploitability of which is still somewhat problematical, or which at any rate are far below the average standard.

“ . . . the present rate of consumption is still so immensely low that the resources expressed above in figures would suffice to cover the demands for many centuries. Even if the low-grade Manchurian ores are excluded the remaining high-grade ore would still be enough for the domestic requirements for about 200 years, according to the present rate of consumption, and perhaps a century if a moderate progressive increase is assumed.”

Since Tegengren's work, additional information has naturally become available. This is reviewed by Wong Wen-hao, Director of the National Geological Survey.¹

“As to the iron ore resources, Tegengren's work is good but still contains some minor errors, omissions and inconsequences. Errors: several ‘contact metamorphic’ ore bodies in the Yangtze valley have been later proved even smaller than he stated. Omissions: certain quite good and worked deposits were not mentioned because the reports in Chinese were not accessible to him. And of course we have had new discoveries since he left, for instance we have discovered a large deposit of high grade magnetite in Western Jehol only 100 miles from Peiping. A large field of oolitic ore in the Yangtze valley was omitted also. On the other hand, several deposits he included in the total reserve are much too small or poor to be practically workable, while what he definitely excluded from workable may not be entirely so. Such is the case for instance with the Shansi ore. There are certainly places where the ore beds are over 2 meters thick, and

¹ Personal communication, Mar. 4, 1930.

then why not workable? It seems to me as absurd to weep on the poorness of China as to sing China's fabulous riches."

TABLE XIII.—IRON-ORE PRODUCTION BY MINES
(In metric tons)

Mine	Province	1928	1929	1930
Anshan rich ore.....	Liaoning	97,071	167,294	
Anshan poor ore.....	Liaoning 540,000	739,954	523,894	
Tayeh.....	Hupei 419,953	476,096		
Hsiangpishan.....	Hupei 212,530	162,194		
Miaoerkou.....	Liaoning 115,000	148,646	141,061	
Yufon.....	Anhwei 112,390	218,817		
Paohsing.....	Anhwei 64,000	140,720	119,400	
Native mines.....	Scattered (Approximately 500,000)			
Total.....	(1924—1,765,732; 1925—1,519,021; 1926—1,252,441; 1927—1,185,946)			

Data from Wong Wen-hao, "The China Year Book, 1931-1932."

There are at present seventeen modern blast furnaces in China with a theoretical capacity of 1,000,000 tons of finished iron and 100,000 tons of steel. Most of these are not in operation and few have ever been operated at full capacity. Production in the Yangtze Valley at Hanyang, Tayeh, and elsewhere has practically ceased, and the output is largely limited to the Japanese plants at Anshan and Pen-chihu in Liaoning.

Most of the producing iron mines in China are under Japanese control. The Manchurian production is used locally, but about 900,000 tons of rich ore is annually exported from the Yangtze Valley. Out of Japan's total requirements of 2,400,000 tons of iron ore for her blast furnaces, less than 200,000 are produced at home. About 500,000 tons are secured from Korea and 900,000 tons are imported from the Malay Peninsula.

One of the major problems of the iron industry of China is the scarcity of coking coal within economic distances of the iron ore. Since it requires about a ton of coke to smelt 2 tons of iron ore, it is essential that suitable coal be available near the iron deposits. China has large reserves of coking coal, but in most cases it is necessary to bring it long distances by rail so that the cost of iron production is high. Until coke can be delivered at the blast furnaces at costs approaching those of foreign producing areas, no significant development can take place.

The present consumption of iron in China, including that imported, amounts to about 600,000 tons per year, or a per capita average

of approximately 3 lb. This compares with a consumption of 30 lb. per person in Japan, 285 lb. in England and Germany, and 550 lb. in the United States. Arnold states that "probably nothing else so well illustrates China's backwardness in a modern industrial sense as do these figures."¹

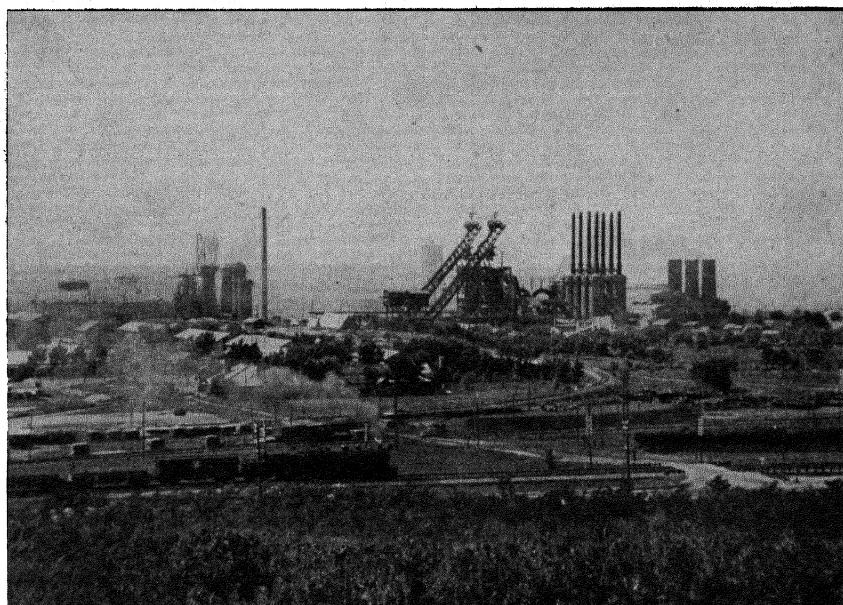


FIG. 57.—The Anshan iron works south of Mukden are operated by the South Manchuria Railway. (*South Manchuria Railway.*)

THE NON-FERROUS METALS

Copper.—Deposits of copper are widely scattered and copper mining is probably the oldest metal industry in the country. The first round bronze coins with square holes were made about 660 B.C. in the Chou dynasty. During successive dynasties the centers of production have shifted from province to province, for most of the deposits have proved to be of limited extent and consequently are short lived. In the days of the Hans, about the beginning of the Christian era, the chief yield was in Honan and later on in Chekiang. During the Tang dynasty (618 to 905 A.D.) the principal mines were in southern Fukien and in Kiangsi, with an annual production of around one thousand tons. This output was increased during the Sung dynasty (906 to 1127) to about three thousand tons annually, while at the time of

¹ ARNOLD, JULEAN, "China, a Commercial and Industrial Handbook," 214.

the Emperor Chien Lung (1775), during the Ching dynasty, the annual yield has been placed at seven thousand tons, with the greatest output in Yunnan. During recent decades and especially since the World War, the industry has been declining and the Geological Survey estimates the present production at less than one thousand tons.



FIG. 58.—Washing tin ore at Kochiu in Yunnan. The ore is first crushed and then stirred with water so that the ore sinks to the bottom while the lighter mud flows off. (*At Photographic Association.*)

(During the present century, copper has been mined in Yunnan, Szechwan, Kansu, Sinkiang, Fukien, Liaoning, and Kirin; and deposits are known to be present in a number of other provinces. The chief producing district is around Tungchwan in northeastern Yunnan where there are four mines. The production in this area amounted to some six thousand tons per year during the reign of Chien Lung but has declined to about three hundred tons at present. The mines are handicapped because the copper must be transported by pack animals and the market price is in excess of that for which imported copper may be purchased at the seacoast.

The second district in point of output is around the Tienpao Shan in Kirin where a production of 300 tons a year was obtained up to 1921 when smelting was stopped. An increasing output is reported from Panling in Liaoning. Both Szechwan and Hupei have mines and

smelters with fairly modern equipment, but in no case have the mines been successful and the production is now negligible.

There is no evidence that China has large reserves of copper, and the prospect of development appears poor.

The chief uses of copper in China are for coinage, munitions of war, and electrical purposes. Imports of copper, chiefly from the United States, reached 40,000 tons in 1924 but have rapidly declined since that time, falling to 1,320 tons in 1930. The export of copper from North China during recent years has been entirely derived from the melting of copper coins.

Tin.—The situation with respect to tin is much better than that regarding copper, and the production of tin ranks next to iron as China's second most valuable metal. (Southwestern China borders the great tin zone of the world which extends from Burma through the Federated Malay States to Netherland India. The Chinese yield reached a maximum in 1920 with 10,000 tons but in 1930 the yield dropped to 6,500 tons. The output in 1925 was roughly 7 per cent of the world total, placing China fourth among the world's producers.

The bulk of China's production comes from the Kochiu district near Mengtsz in southern Yunnan. There is one modern plant at Kochiu, but most of the tin is obtained from native mines, of which there are over a hundred. Mining is handicapped by the scarcity of charcoal, for the hills in the vicinity have been denuded of trees, and by the lack of water, which restricts operations to the rainy season from April to July. Over sixteen thousand men are employed in the Yunnan industry. Tin is also produced in eastern Kwangsi, southern Hunan, and in the island of Hainan.

Most of the tin from Yunnan is shipped to Hongkong by way of the railroad through Indo-China and therefore appears as an export from China. In Hongkong the tin is further refined and much of it finds its way back into China where it is used in the manufacture of pewter, foil for spirit money, linings for tea chests, and as alloy in the manufacture of bronze.

Antimony.—China's most distinctive mineral resource is antimony, of which she has almost a world monopoly, supplying about 80 per cent of the entire production. Antimony is a relatively unimportant metal but is useful as a hardening agent for lead and enters into the composition of type metal and antifriction metal. Large quantities are used by the automobile industry for storage batteries and bearings, the average amounting to three or four pounds per car.

Ores of antimony are widely distributed in South China but are unknown in the North. Hunan is the leading producer and there is a

small yield in Kwangtung, Yunnan, Kweichow, and Kwangsi. The chief mines are in central Hunan in the vicinity of Hsikwangshan. The richness of the ore varies from 25 to 60 per cent metal, and mining is both simple and cheap. There are several hundred mines and the output fluctuates with the market price, the rate of exchange, and political conditions. The ore is smelted at Hsikwangshan, Changsha, or Hankow and is exported to Europe, the United States, and Japan.)

The Hunan production amounted to only 3 tons in 1908 but rose during the World War to a peak in 1916 of 19,934 tons of 99.5 per cent pure antimony regulus and 18,252 tons of 70 per cent crude antimony, with a corresponding increase in price from $4\frac{1}{2}$ cts. per pound United States currency to 49 cents. The normal Chinese output is now about 20,000 tons of metallic antimony, although the output dropped to 15,000 tons in 1930. Since the Hunan reserves are estimated to contain 2,000,000 tons of high-grade ore, it is clear that China may continue indefinitely to be the leading producer. China uses almost no antimony, so that the export of the metal enables China to purchase other resources in which she is deficient.

Tungsten.—The only other metal in which China dominates the world market is tungsten, an important alloy in the manufacture of high-speed tool steel and extensively used for the filaments of electric lights. Like antimony, tungsten is a recent discovery in China, having been mined only since 1915. During the World War the production rose rapidly, reaching over 10,000 tons of 60 per cent tungsten concentrate. The output declined after the war and is now from 5,000 to 7,000 tons, representing from 50 to 75 per cent of the world's requirements.

(The ores are found in Kiangsi, Hunan, and Kwangtung and are easily worked by surface operations. The Hunan district was the first to be developed but has been surpassed in yield by the alluvial deposits of southern Kiangsi, of which the chief is at Lihwashan near Nananfu. The ore goes chiefly to Germany.

Tungsten is present in the same general zone as tin and both are sometimes found together. The reserves of tungsten are large and the production could be greatly increased if the demand should warrant. Bismuth is also associated and promises to be of considerable importance in the future.

Precious Metals.—In view of the fact that Chinese currency is on a silver basis, it is surprising to find that China is not now and apparently never has been an important silver producer. Next to India, China is the largest consumer of silver in the world. A small amount is obtained in Hunan and there is also a limited output in

Jehol, Kwangsi, and Yunnan. In most cases the metal is associated with lead deposits and is merely obtained as a by-product. The total production is probably not over twenty thousand ounces. Since silver has been used for many centuries and its metallurgy is simple, the absence of any significant production can only mean that China is poor in silver deposits.

The gold deposits of China are widespread, but all the important occurrences are confined to the far north near the Siberian border in Heilungkiang, Kirin, and Outer Mongolia or in the Tibetan Borderland. The principal Manchurian yield is along the Amur River near Aigun, while the Mongolian mines are north of Urga. Most of the gold is obtained from placer deposits, but there are a few mines in quartz veins. Gold has been obtained in these localities for many years but little is known about the reserves. The proper development of the Manchurian area is handicapped by chronic bandit conditions, while the Mongolian fields are remote and at present cut off by political complications. In 1915 V. K. Ting estimated the yield of the Manchurian fields at 120,000 taels or Chinese ounces per year and that of Mongolia as 60,000 taels. In 1925 C. Y. Hsieh estimated the Manchuria yield at 150,000 taels and that of Outer Mongolia as 10,000 taels with the total yield 196,900 taels. The present production is considerably less than this, and W. H. Wong in 1928 placed the Manchurian production at 50,000 taels and the total at 92,000.

Gold has been found in almost every province of China, usually in very small quantities in stream gravels. Outside Manchuria and Mongolia the only producers of even passing importance are Shantung, Szechwan, Hunan, Kansu, and Sinkiang. Few data are available as to the output of these scattered deposits, for much of the yield does not pass through official channels. Tibet is supposed to contain gold, but no geological surveys have been made and, even were gold present, the inaccessible nature of the region as well as political complications would make development very difficult.

The following quotation from von Richthofen, quoted approvingly by Thurston and Bain,¹ describes the poorness and unimportance of the usual placers and gives an indication of the character of much of the mining industry in China.

"From my own experience on the subject I have arrived at the conviction that the great number of places in which gold is washed from river sand in China at the present day, far from furnishing a proof of the wealth of the country, is, on the contrary,

¹ BAIN, H. FOSTER, "Ores and Industry in the Far East," 157-158.

clear evidence of the superabundance of human labor, the general prevalence of relatively low wages, and the poverty, individually, of those engaged in the search for gold. The gold washers today, with probably very few local exceptions, earn less than the lowest wages which they can get for ordinary labor, and take to their occupation in those seasons only when there is the least demand for field work. We can, therefore, safely conclude (with those few exceptions) that the greater the yield in gold, the greater will be the poverty of any one province. The sum total is, in some of the overpopulated districts, not inconsiderable, and has quite misled the judgment of those who have even witnessed the miserable conditions of the gold diggers. The number of places in which gold occurs in the various hilly countries of Europe is probably greater, on an average, than an equal area in China. But no notice is taken of them because nobody could be induced there to wash gold for so little return as is generally obtained in China."

Lead and Zinc.—Lead and zinc ores are commonly associated with each other. Many occurrences are known in both northern and southern China, but few deposits have been found which are large enough to justify modern operations. The principal area is in Hunan with the largest production at Shuikoushan, near Hengchow, where there is a modern mine which has produced as much as 10,000 tons of 50 to 60 per cent lead concentrate and 30,000 tons of 25 to 35 per cent zinc concentrate in a year. The 1930 output was 7,355 and 17,109 tons, respectively. Other mines are found at Kungshan in Yunnan, and in Liaoning, Szechwan, Chekiang, Kweichow, and Shantung. The reserves in all of these localities appear to be limited, with the largest amounts in Hunan. If any considerable output is to be obtained, it will probably be from small mines. The bulk of the export goes to Belgium and is more than offset by imports.

Manganese and Mercury.—Manganese and mercury complete the list of metals of which China is an important producer. Manganese is one of the alloys used in the production of certain forms of steel, and deposits have been developed or discovered in Hunan, Kwangtung, Kwangsi, Kiangsi, and Liaoning. The best ore is found in Hunan near Siangtan but is of only fair quality. The 1930 production was about 35,000 tons and most of the ore is exported to Japan.

(Mercury has been known for more than two thousand years in China, the chief use being for red ink and paint. The production is centered in Kweichow and in the bordering provinces of Hunan, Szechwan, Yunnan, and Kwangsi. The content of mercury in the ores

is low, seldom exceeding 3 per cent, and native methods are used entirely. The present production is much less than that of the nineteenth century and exports have practically ceased.

NONMETALLIC RESOURCES

Far ahead of all other natural resources is the soil which for so many centuries has made agriculture possible. Associated with soil and of equal value is the climate. These resources are too often over-

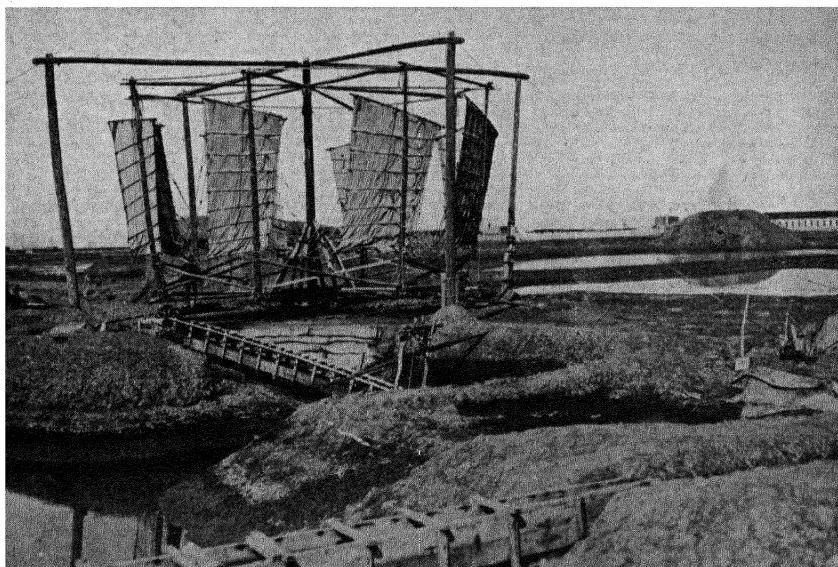


FIG. 59.—These windmills near Tientsin lift sea water into the shallow ponds shown at the right where it is evaporated, leaving behind the salt which is scraped up into piles. (*U. S. Bureau of Foreign and Domestic Commerce.*)

looked in a list of nature's gifts, but without their favorable assistance there could be no China as we know it today. The next most valuable of the various nonmetallic resources are the materials used for structural purposes, such as building stone, gravel, sand, and clay. All parts of China except the great plains are well supplied with stone, and deposits of pottery clays are widespread.

Salt.—China's salt is obtained by the evaporation of sea water, from inland salt lakes, and from ancient sediments which contain rock salt. About 80 per cent of the production is from sea water which is evaporated by solar heat in artificial ponds along the shore. South of the Yangtze, where the humidity is high and evaporation not so rapid as in North China, the brine is often boiled under fires in the

latter stages of the process. Marine salt is used throughout the coastal provinces. The following table shows the distribution of the coastal salt areas and the annual yield, one picul being equal to 133 lb.

TABLE XIV.—MARINE SALT PRODUCTION

Province	Number of salt fields	Annual production, piculs
Liaoning.....	7	9,000,000
Hopei.....	3	3 to 7,000,000
Shantung.....	6	900,000 to 1,500,000
Liang—Wei (northern Kiangsu).....	15	6 to 7,000,000
Liang—Chek (southern Kiangsu and Chekiang).....	29	3,000,000
Fukien.....	14	2,500,060
Kwangtung.....	17	5,000,000

Mongolia and the northwestern provinces contain numerous enclosed lakes in which salt has accumulated. In some cases the water has entirely evaporated or at least dries up during a part of the year, so that it is only necessary to scrape up the salt. Elsewhere the salt must be evaporated as along the seashore. An important salt lake is found at Chiehchow in southwestern Shansi where the output is 900,000 piculs annually. A considerable amount of salt is brought from the Ordos and Alashan Deserts to Paotowchen at the end of the Peiping-Suiyuan railroad from where it is shipped to Shansi and Hopei.

The province of Szechwan is famous for the salt wells which date back to ancient times. These wells penetrate to buried salt beds and a few of them are as much as two or three thousand feet deep, having been dug by very creditable native methods. There are twenty-six salt districts in the province, of which the most important is in the vicinity of Tzeliutsing, southeast of Kiating, with 1,580 wells in operation in 1923, when the production in Tzeliutsing and vicinity reached 5,366,590 piculs. Modern well-drilling methods have been introduced in recent years and the output is increasing. The total number of wells which have been drilled for salt in Szechwan is estimated to reach seventy thousand, but most of these are now abandoned. A number of the wells also yield natural gas which is used for evaporating the brine.

Cement.—While cement is not a natural product, it may, nevertheless, be mentioned here. The manufacture of cement is a recent introduction in China, but there are now more than a dozen modern plants, half of them having a capacity of at least one thousand barrels

a day. The largest is at Tangshan north of Tientsin. The average per capita consumption, amounts to about 3 lb. in China, as compared with 85 lb. in Japan and 450 lb. in the United States. The raw materials consist chiefly of limestone and clay, deposits of which are widespread. An important minor constituent is gypsum, concerning which an interesting situation has arisen. China has large reserves of gypsum and some fifty thousand tons annually are produced in Hupei, but the cement companies around Shanghai find it cheaper to import gypsum from Germany than to use the native product.

Sulphur.—The importance of sulphur in modern industry is seldom appreciated, for it does not enter into general trade and is used chiefly in the form of sulphuric acid. It is the most essential of all the chemicals, playing an important rôle in the refining of petroleum, the pickling of iron and steel, the manufacture of celluloid, the preparation of fertilizers, and a host of other important operations. Bain places it along with iron, coal, and petroleum as one of the four minerals essential for industry in tonnage quantities.

No important deposits of native sulphur have been found in China, but there is a small production from pyrite shale associated with the coal series and in lead and zinc deposits. The leading province is Hunan with a production in 1930 of 2,799 tons. Other producers are Liaoning, Honan, Shansi, Shantung, Anhwei, Hopei, and Chekiang. The total yield is insufficient for the demand, and several thousand tons are imported from Japan. The chief use in China at present is for firecrackers and for military purposes.

CHINA'S MINERAL PRODUCTION

All statistics of mineral production are admittedly incomplete, for it is impossible to collect reports from the many small native mines, and the output is often misrepresented. The National Geological Survey has prepared official estimates for several years, and their figures are the most comprehensive available. The latest estimates of the Survey are for 1925 prepared by C. Y. Hsieh (Table XV). Since their appearance, another set of figures has been published by Torgashoff which are considerably larger than those of Hsieh and of uncertain value. Both estimates are for 1925 except as indicated. The wide discrepancies may serve as reminders of the uncertainties involved.

AN INDUSTRIAL FORECAST

China has two principal areas of mineral wealth. One is in the Loess Highlands where there are enormous reserves of high-grade coal. The other is in the South Yangtze Hills and the Southwestern

TABLE XV.—MINERAL PRODUCTION IN 1925

Product	Hsieh ¹			Torgasheff ²	
	Metric tons ³	Value, yuan	Percent-age of 1924 world output	Metric tons ³	Value, yuan
1. Coal.....	24,255,042	200,289,924	1.8	35,000,000	439,404,890
2. Structural materials.....	.....	.....	.....	80,400,000	89,652,000
3. Salt.....	3,639,000	36,390,000	21.	2,156,550	68,489,290
4. Cement.....	2,512,714 (barrels)	10,050,856	0.5	7,185,000 (barrels 1927)	43,100,000
5. Pig iron.....	369,617	14,784,680	0.5	369,617	18,333,004
6. Steel.....	.....	.....	.....	30,000	2,710,000
7. Iron ore (exported).....	.....	.....	.....	815,913	8,183,106
8. Tin.....	9,354	19,643,400	7.	9,200	19,606,624
9. Antimony.....	19,289	11,524,210	78.	.....	.....
Regulus.....	.....	.....	.....	16,168	.....
Crude.....	.....	.....	.....	2,955	8,037,030
Concentrate.....	.....	.....	.....	2,300	.....
10. Tungsten ore.....	5,282	5,282,000	72.	5,288	1,462,540
11. Zinc metal and ore.....	39,445	1,177,050	0.3	18,542	7,180,000
12. Lead metal and ore.....	10,802	1,240,410	0.2	3,503	1,244,000
13. Gold.....	197,900 (taels)	6,926,500	0.8	10,670 (kilograms)	14,183,202
14. Kaolin.....	.....	.....	.....	470,000	6,580,000
15. Clay.....	88,196	1,787,920	.....	.....	.....
16. Alum.....	.....	.....	.....	50,000	4,500,000
17. Soda.....	61,500	3,075,000	3.7	50,000	3,003,000
18. Manganese ore.....	43,439	1,563,804	1.6	50,000	1,000,000
19. Mercury.....	470	1,546,300	8.	42	156,980
20. Gypsum.....	67,000	1,072,000	1.1	80,000	896,100
21. Copper.....	1,114	746,380	0.1	2,345	1,725,820
22. Sulphur.....	2,348	143,040	0.1	2,348	3,757,568
23. Silver.....	35,569 (taels)	46,246	0.01	1,231 (kilograms)	52,800
Total.....	.....	.....	1.3	.....	775,964,756

¹ HSIEH, C. Y., "The China Year Book, 1928," 69-72.² TORGASHEFF, BORIS P., *China Weekly Review* (Dec. 22, 1928), 168-172. (Torgasheff's estimates were published in United States currency but for ready comparison have been here converted into yuan at the rate of 2:1.)³ Except as noted.

Tableland where there are deposits of tin, antimony, tungsten, copper, lead, zinc, and a variety of other nonferrous minerals. The iron ore is in both the northeast and central areas. The two major mineral areas are in mountainous districts rather difficult of access and removed from the centers of population. The minerals of the South are of the type which combine high value with small bulk so that they can prof-

itably be transported. Coal and iron, however, cannot economically be shipped very far by rail, and the fact that the chief occurrences of coking coal and good iron ore are widely separated is an unfortunate handicap.

There are three areas where large-scale industry may in time be expected to develop, none of which is in the regions above mentioned. One is along the Yangtze Valley where cheap transportation is available and where iron ores are present in several localities. The mineral deposits of Chekiang, Kiangsi, Hunan, Kweichow, and Szechwan are tributary to this area, and the region is in contact with the growing urban and industrial centers near the coast.

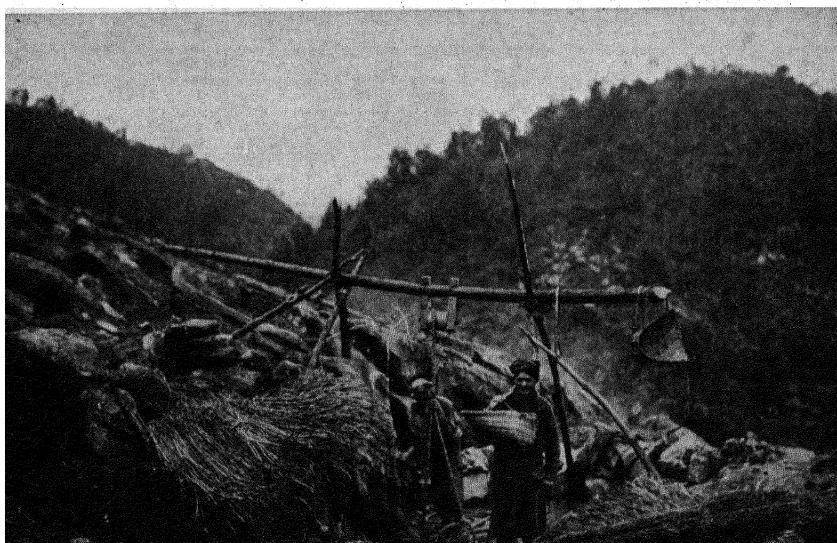


FIG. 60.—Shaft mining under primitive conditions. One or more men at the bottom of the pit place the rock in baskets which are then hauled up to the surface. (*American Museum of Natural History*.)

A second industrial area may develop along the western margin of the North China Plain where the coal of Shansi can be brought out to level land. While this belt would be well supplied with coal, it is poor in the metals with the possible exception of iron. Southern Manchuria is the most rapidly expanding mining and industrial area at present, owing to Japanese stimulus, but it is doubtful whether it has adequate resources to reach or maintain leadership. Political and economic factors may influence localization of certain industries, but in the long run industrialization will be guided by factors such

as the geographic distribution of ore bodies, transportation routes, and markets.

The present mineral production of China offers little indication of the quantities which may be secured in the future. In no case is the output at a maximum, being held back by inadequate methods, expensive transportation, lack of a greater demand, and political factors, all of which will change in time.

It is clear that China has resources of coal and of many minor minerals which are adequate to care for any expansion which is likely to take place for some decades or even centuries. Man power is also present in superabundance. In petroleum, copper, sulphur, timber, and probably iron, however, China is seriously deficient and the shortage of these essentials is her greatest industrial problem.

There seems no probability that China as a whole will ever rival Western Europe or Eastern North America in industrial activity or that she will become a large-scale exporter of manufactured products. Limited areas, however, may become highly developed in response to domestic markets.

The great accumulation of wealth in the advanced countries of the West during the past century has been largely due to the unlocking of buried mineral treasures. The available power per person in the United States is now probably one hundred and fifty times that of China, while the average per capita wealth is something like five hundred times as great. Various factors of race, environment, and history enter into this contrast; but in so far as it depends upon the presence of natural resources, it does not appear likely that a China of 485,000,000 people can attain a similar standard.

CHAPTER VI

CHINA'S WORLD CONTACTS

THE HISTORICAL BACKGROUND

Much has been written of Europe's early outreach to the Orient, but little has been known of China's own explorations and trade westward. As early as 128 B.C., the explorer Chang Chien arrived in Bokhara and Ferghana as a representative of the Han Emperor Wu Ti who was gradually extending his domain in Central Asia. The region of Lop Nor was captured in 121 B.C. and Ferghana in 100 B.C. China thus came to rule the same region west of the Pamirs which had been conquered by Alexander the Great two centuries earlier. This westward expansion was made across the bitter Taklamakan Desert which had stopped Europe's eastward exploration and trade.

With this conquest of inner Asia began the silk trade, which has been called by Hudson the most far-reaching large-scale commerce of antiquity, reaching from the Pacific to the shores of Britain. Over the great highway of Central Asia passed other caravans with porcelains, jade, lacquer, and similar artistic products.

The first Chinese scholar to visit India was Fa Hsien in 413 A.D., going overland and returning by sea. Two centuries later, the monk Hsuan Tsang made pilgrimages to central Asia and south India in his studies of Buddhism. While it is evident that the Chinese as a people were little concerned with outside contacts, it is equally true that individual scholars and merchants ventured across much of Asia.

As early as 300 A.D. the Arabs had a settlement in Canton and were the intermediaries between the Chinese merchants, who never went west of Aden and seldom beyond Singapore, and the Greeks who did not come east of Ceylon. During the Sung dynasty about 1000 A.D. there are records of a diversified foreign trade. The first direct trade with Europe was established by the Portuguese in 1516, who were followed in turn by the Spanish, Dutch, and British. Still later it was the tea trade and the clipper ships which brought Americans to Chinese waters.

Until the latter part of the nineteenth century foreign trade consisted very largely of exports, while since then imports have been

more significant, every year since 1877 having shown an excess of visible purchases over sales. The early lack of interest in foreign goods on the part of the Chinese is but a natural outgrowth of the isolation and comparative geographic superiority of China to its neighbors. When the first British ambassador sought to open trade relationships with China in 1793, there was much justification for the Emperor

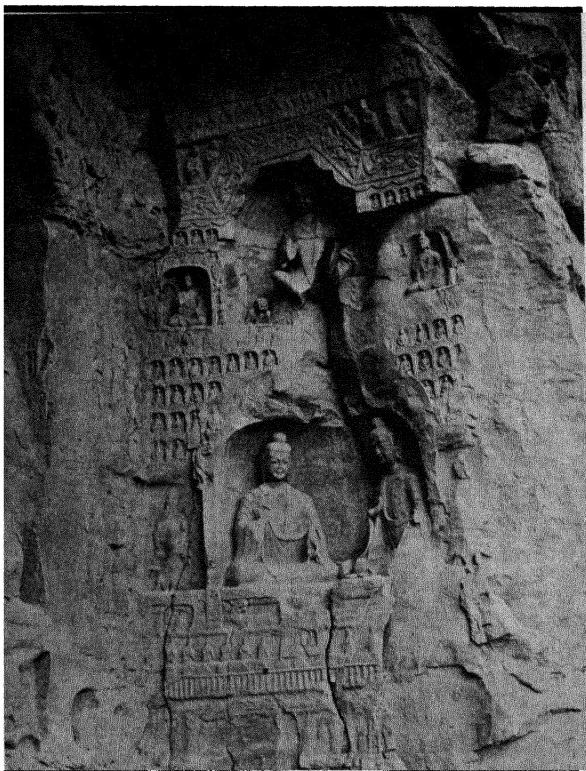


FIG. 61.—The earliest importation from India was Buddhism, which came to China by way of Sinkiang. These carvings near Tatung in northern Shansi date from the fifth century. (*Ato Photographic Association*.)

Chien Lung's oft-quoted reply: "Strange and costly objects do not interest me. As your ambassador can see for himself, we possess all things. I set no value on objects strange and ingenious and have no use for your country's manufactures."

China's economic self-sufficiency is illustrated in the early trade with the United States. The Yankee clippers which made the trip around Cape Horn in search of tea and silk were at a loss to find some

article to sell to China. Silver, furs, and ginseng were acceptable, but did not represent much of a cargo. Finally ships from New England even carried out ice, rather than go empty, and sold it in South China, so that there is today Icehouse Street in Hongkong. With the breakdown of China's isolation and the industrial revolution in the West, the foreign trade of the Orient has expanded enormously, both in character and in volume.

In order to pay for their purchases in the early days, foreign nations were obliged to ship silver to China to a total of many hundreds of millions of dollars. It was partially to stop this steady drain on the silver stock of Europe that the importation of opium was introduced, and it was the large purchases of opium by China which later caused silver to flow out of rather than in to China.

One of the most remarkable characteristics of the troubled decades since 1911 has been the resiliency of China's trade, both foreign and domestic. Even during years of disorder and interrupted communications trade has continued to expand. When civil warfare has closed one trade channel, resourceful merchants have discovered another. From the standpoint of business, the greatest political need is not good government and low taxes so much as stability and continuity. Given peace and something like normal world conditions, business booms. World markets are ready to take increasing amounts of China's products, especially where quality is improved, and the internal demand for the manufactured products of the outside world is far from satisfied.

Foreign trade is also vitally related to international exchange. Since China is on a silver standard, the value of the currency fluctuates with the market price of metallic silver. The normal par relationship between the Chinese currency, officially called a Yuan and sometimes known as the Mexican dollar because of its original source, and United States gold dollars is 2:1. During the World War when silver climbed to a gold dollar an ounce, the exchange was 1:1, while in 1932, with silver selling for around twenty cents gold, the quotation was nearly 5:1. Even the most insistent commodity movements are made bewildering by such wide fluctuations. Thus a fountain pen sold in the United States for, say, three dollars would cost in China, exclusive of duty, anywhere from three to fifteen yuan according to the price of silver.

To add to the confusion, the Chinese Maritime Customs computes all statistics in terms of an arbitrary uncoined unit, the haikwan tael, equal to 583.3 grains of fine silver and worth approximately yuan 1.50, \$0.75 in United States currency, and £0/3/- (British). The haikwan tael is not to be confused with other taels widely used

in commercial transactions. The haikwan tael has had the following average values in United States currency: 1913, \$0.66; 1920, \$1.24; 1925, \$0.84; 1926, \$0.76; 1927, \$0.69; 1928, \$0.71; 1929, \$0.64; 1930, \$0.46; 1931, \$0.34; 1932, \$0.34. While it is essential to consider China's trade in terms of equivalent gold values, it is also true that to the bulk of the Chinese it is their own currency which appears more or less stable, so that what the nation spends or receives has a domestic value more in keeping with the Customs figures.

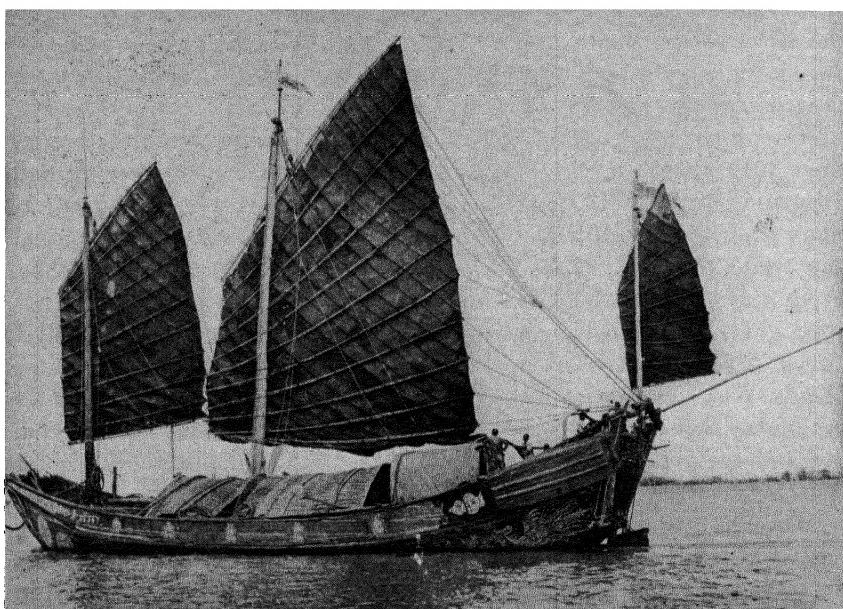


FIG. 62.—A large volume of river and coastwise trade is carried in picturesque native junks. Each port has boats of characteristic design. (*Mactavish and Company*.)

China's entire foreign trade amounted to only 130 million haikwan taels in 1870 and 370 million in 1900. Foreign trade in 1911 reached 848,842,109 haikwan taels, as compared with 2,342,965,719 in 1931. This is nearly a threefold increase in twenty years. The per capita total is still probably the smallest of any important country in the world, the average for the years 1924–1928 being only about \$3.00 (United States currency) per year, as compared with \$7.50 for India, \$37.50 for Japan, \$80.00 for the United States, and \$230 for the United Kingdom.

The period from 1924 to 1928 was the last five-year interval with homogeneous figures, for since that time increased Customs rates and

world-wide depression have introduced new elements into international trade. The trade graphs (Figs. 63, 66, 70, 71) are based on these years.

Trade developments of the past two decades present a striking reversal of old concepts in that China is now becoming an importer of raw materials and an exporter of manufactured goods.¹ China is already producing the bulk of her domestic textile needs and is on the way to becoming a serious competitor for the cotton-goods market of Siam, Indo-China, the Malay States, and even India. In 1932 manufactured cotton goods imported into China amounted to 8 per cent of the total imports, while cotton goods exported amounted to 11 per cent of all exports. Corresponding figures for 1913 were 31 per cent for imports and 0.3 per cent for exports. Whereas raw cotton exports predominated up to 1913, since then there has been a surplus of imports. In other words, in the two decades prior to 1933, China has changed from a major to a minor market for foreign textiles and has become a serious competitor for the cotton-goods trade in other Far Eastern countries. Such a change betrays the economic emergence of industry and is of profound importance for the industrial ambitions of Japan.

A similar transformation has occurred with foodstuffs. It has been assumed that, since China was largely agricultural, she would be an exporter rather than an importer of foods. What has actually happened is that imports of cereals have risen from 3 per cent of the total in 1913 to 16 per cent in 1932, while exports have merely increased from 2 to 3 per cent in the same period. Here again this has a bearing on Japan's problems, for it indicates that China's need of increased agricultural area is quite as urgent as that of the island empire, and that no export surplus can be secured from China.

China is far from being an industrial nation, but it is clear that, despite the political unrest of recent years, economic changes of fundamental character have occurred which must increasingly have their effect on all international contacts.

THE EXPORT TRADE

During the nineteenth century tea and silk were the leading items of China's export business, just as opium and cotton goods were the principal imports. During the present century the proportionate place of both tea and silk has fallen sharply. The same is also true of the artistic products which characterized the foreign sales of even earlier days. (At the present, raw materials such as beans, silk, cotton,

¹ CLARK, GROVER, *China's Economic Emergence*, *Annals of the American Academy of Political and Social Science*, CLXVIII (July, 1933), 84-94.

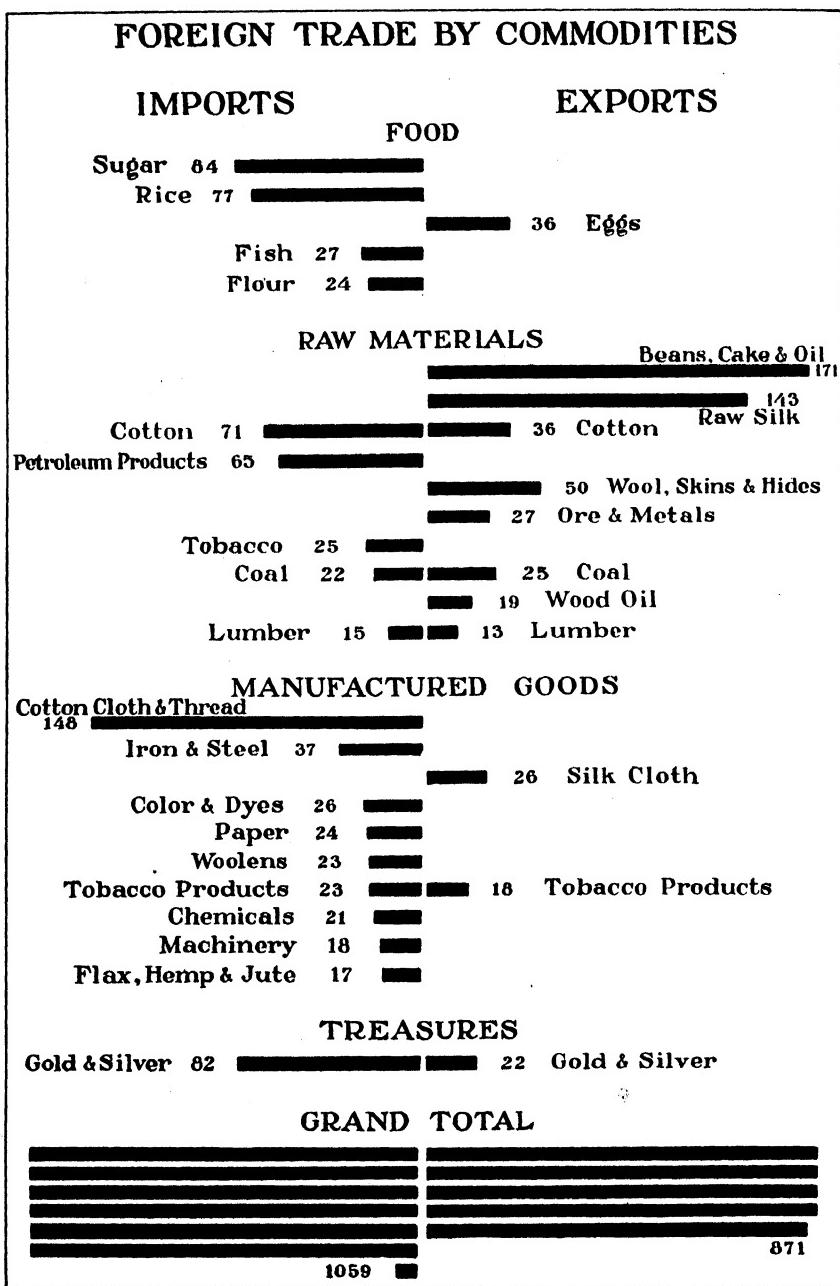


FIG. 63.—China's foreign trade by commodities. All figures are in millions of haikwan taels and are the average of 1924 to 1928.

hides and skins, wool, coal, metals and ores, and vegetable oils provide approximately one-half the total exports. Foodstuffs, including egg products and cereals, amount to one-third, and manufactured products like cloth and cigarettes constitute one-sixth. The bulk of the trade has been due to foreign merchants who have come to China seeking products rather than to Chinese salesmen who have gone abroad.

With the present diversification of exports has come a large increase in their value, even during periods of economic difficulties abroad. Unfortunately instability within China resulting in ruinous taxation, interrupted transportation, and civil warfare has kept the country from taking full advantage of the world market. As it is, exports have risen from 159 million haikwan taels in 1900 to 381 million in 1910, 644 million in 1920, and 895 million in 1930.

TABLE XVI.—EXPORTS DIRECT TO FOREIGN COUNTRIES
(In thousands of haikwan taels, 000 omitted)

Product	1928	1929	1930	1931
Beans and bean products.. .	213,699	229,744	184,923	209,954
Raw silk, cocoons, etc. . . .	160,790	165,190	119,031	95,756
Eggs, and products thereof	43,779	51,720	51,161	37,757
Cotton goods and yarn.....	35,999	36,836	31,958	48,254
Skins, hides, and leather....	52,475	45,470	34,338	37,700
Tea.....	37,134	41,252	26,284	38,253
Seeds and seed cake (exclusive of bean cake and peanut cake).....	22,829	33,075	35,561	33,008
Ores, metals, and minerals, and manufactures thereof	30,134	33,634	34,211	26,937
Coal.....	28,237	30,908	27,113	31,059
Raw cotton.....	34,159	29,604	26,499	26,961
Cereals.....	36,717	26,268	30,403	22,024
Peanuts, and products thereof.....	16,595	16,598	37,498	41,458
Wood oil.....	23,302	23,520	30,547	20,416
Silk piece goods and pongees	23,901	21,031	19,652	24,412
Total net exports.....	991,354,988	1,015,687,318	894,843,594	909,475,525
Net value of imports and exports.....	2,187,324,259	2,281,466,139	2,204,599,336	2,342,964,719

Data from annual reports on "Foreign Trade of China" published by the Chinese Maritime Customs.

(The most interesting item of export is the soy bean, grown in increasing amounts in the Manchurian Plain and also in the Yangtze Valley. Prior to 1900 beans occupied a very insignificant rôle in the

list of exports but have now risen to first place, amounting to 23 per cent in 1931. It is the development of the bean industry which has made Manchuria so prosperous and has caused it to be the only large section where exports exceed imports. Dairen is the chief port of shipment, although some beans from the Harbin area are transported over the Chinese Eastern Railway to Vladivostok. The average soy bean contains 10 to 13 per cent of oil, with selected varieties yielding as high as 22 per cent. From a third to a fourth of the beans are pressed before shipment to separate the oil from the residue which is made into cakes and used as fertilizer or cattle feed. A considerable part of the cake is shipped to Japan for use as a fertilizer for mulberry, while the oil goes to Europe and the United States. Inasmuch as the United States buys most of Japan's exported silk, America has a double interest in the Manchurian bean.

Raw silk and silk goods have long played an important part in foreign trade. In 1860 China supplied one-half the world's export silk, but by 1914 the proportion had dropped to a quarter. While the value of the trade steadily increased until 1929, the quantity has remained roughly stationary. In 1899 raw silk represented 42 per cent of China's total exports, while it had fallen to 34 per cent in 1907, 26 per cent in 1913, and in 1931 to but 13 per cent. The export of silk and silk cloth amounted to 305,383 piculs in 1910, 230,799 in 1920, and 282,824 in 1930. Until 1905 Japan and China were about on a par in the export of silk, but since that time Japan has forged ahead and now supplies several times as much as China. The Yangtze Delta is the principal producing area, followed by Canton. Some of the silk is the finest in the world, but lack of care and standardization greatly handicaps the export business. With proper methods the production might be considerably increased. A large part of the export consists of white silk, of which roughly one-third comes from the Shanghai area and two-thirds from around Canton. Shantung and Liaoning supply most of the wild silk, while Szechwan and Shantung furnish the yellow silk. The exact distribution of China's trade is uncertain, but the United States takes at least two-thirds, partially through Hongkong and Japan, while France and Japan are the two other principal customers.

China's egg products have found a growing place in the world market. Some of the eggs are frozen and others are shipped in bulk with the shells removed. Prepared albumen and yolk are also important. These exports represent between three and four billion eggs a year, and the quality is high. The Yangtze Plain is the chief producing

center, with England, Japan, and the United States the chief consumers.

Although China is an exporter of cotton, she is also an importer, buying about twice as much as she sells. This peculiar situation is due to the fact that China produces short-staple cotton which Japan and the United States purchase for mixing with long-staple cotton and for special purposes, such as making blankets. The cotton which China buys is mostly of the long-fiber variety necessary for the manufacture of certain cloths. As China increasingly weaves her own cloth, the export of raw cotton will decline.

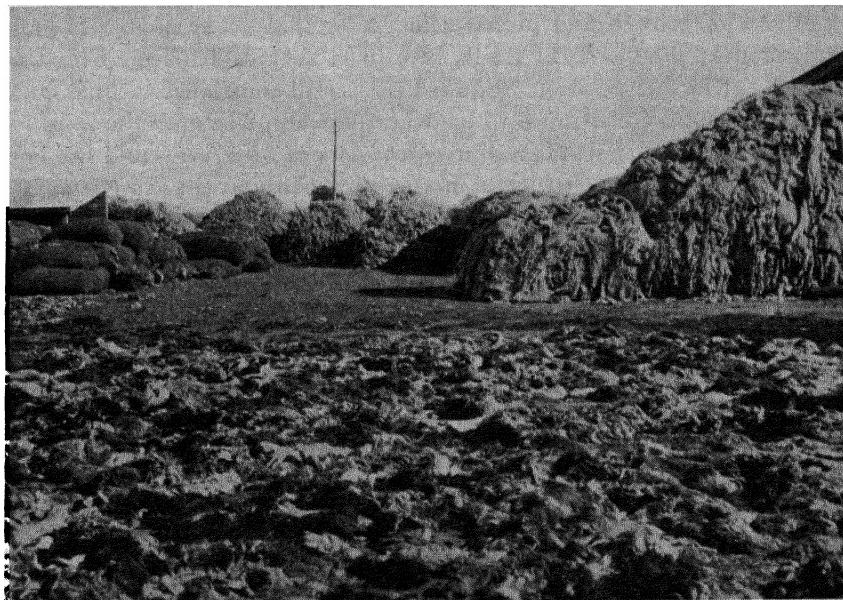


FIG. 64. --These piles of wool at Hailar in western Heilungkiang have been brought in from Mongolia for shipment to the Soviet Union and the United States.

Animal products, such as wool, hides, and furs, occupy a significant place. The Loess Highlands and the Central Asiatic Steppes and Deserts are the chief sources of wool, which comes from native unimproved stock and is mostly of poor quality. During the past decade the export has been restricted by military operations and difficulties in transportation. Most of the wool goes to the United States for the manufacture of carpets. Hides originate in the Yangtze Valley and an exportable surplus exists only because the Chinese tanning industry is poorly developed. Leather is imported to balance the export of the raw product.

At one time China supplied the world with tea and it formed the country's largest export. In 1867 China furnished 90 per cent of all the tea consumed in the western world and four years later tea formed 54 per cent of China's total exports. Since then the trade has steadily declined under competition of teas from Ceylon, Assam, Java, and Japan which are raised by careful methods often on large plantations. By 1899 China's tea trade had declined to 16 per cent of her exports, in 1913 it had fallen to 8 per cent, and in 1931 it amounted to less than 4 per cent of the total. The trade has now so far decreased that it is only important when there is a crop failure elsewhere. This great trade was lost to China largely because of the failure to adopt scientific methods of growth and preparation. Now that other countries have a monopoly of the world trade, it will be very difficult for China to regain her former position. So much tea is still consumed within China that the country continues to hold first place in world production.

The export of natural resources consists of ores, coal, and lumber, each item being balanced by an importation of about the same amount. Chief among the ores is that of iron which moves from the Yangtze Valley to Japan, where some of that which is made into iron or steel is shipped back to China. Other minerals are tin, antimony, and tungsten for which there is no demand in China. Shipments of coal are chiefly to Japan and originate in Shuntung and Liaoning. It may be of interest to note in passing that Japan took but two million tons of coal from China in 1931, which is only about 5 per cent of her domestic consumption. In view of the scarcity of wood in China, the large export is rather surprising. The trade consists mostly of varieties found in Manchuria for which Korea and Japan are the markets.

THE IMPORT TRADE

There are few sections of China which have not been influenced by imports from overseas to some degree. Foreign commodities have penetrated the interior very unequally, however, in distribution, character, and quality. Enamelled wash basins from Japan, raisins from California, wrist watches from Switzerland, cloth from England, and kerosene from Sumatra may be found in remote cities along all major trade routes. Near-by villages, however, may contain scarcely a single foreign-style article. These new products are not only changing habits of life but are modifying people's thoughts and their conception of the outside world. Whether for better or worse, articles such as automobiles, the radio, electric lights, and moving pictures are creating a new China.

The Maritime Customs lists over nine hundred categories of imports, about a third of which are textiles. The increasing diversification of trade is indicated by the fact that in 1900 there were only 18 classifications which reached a million haikwan taels or over, while in 1930 there were 228 such classes.

TABLE XVII.—IMPORTS DIRECT FROM FOREIGN COUNTRIES
(In thousands of haikwan taels, 000 omitted)

Product	1928	1929	1930	1931
Cotton goods (exclusive of raw cotton).....	190,030	188,574	149,839	121,078
Raw cotton.....	67,981	91,124	132,266	179,082
Sugar.....	98,698	98,761	86,391	85,889
Other textiles.....	97,704	94,534	64,071	81,577
Petroleum products.....	80,923	74,184	77,818	95,218
Rice.....	65,039	58,981	121,234	64,376
Metals and minerals.....	67,556	70,855	75,881	85,125
Chemicals.....	32,666	34,255	46,905	48,713
Tobacco.....	61,937	49,162	58,373	62,681
Flour.....	32,802	64,008	31,926	30,920
Paper.....	29,049	34,246	37,384	45,405
Machinery.....	19,472	29,887	44,283	43,605
Dyes and pigments.....	28,519	33,192	25,765	39,441
Wheat.....	3,339	21,431	12,831	87,639
Timber.....	18,018	27,819	23,178	34,685
Total net imports.....	1,195,969,271	1,265,778,821	1,309,755,742	1,433,489,194
Net value of imports and exports.....	2,187,824,259	2,281,466,139	2,204,599,336	2,342,964,719

Data from annual reports on "Foreign Trade of China" published by the Chinese Maritime Customs.

In view of the low purchasing power of the average buyer, articles of import which are designed for retail distribution must be priced as low as possible, regardless of quality. Other things being equal, it is thus those nations with low production costs and attractive exchange rates which are in the most favorable position to capture China's trade. The high wages of America and the emphasis upon quality in her goods make competition with other nations difficult. As per capita wealth rises in China, buying power will increase and there will be a shift from cheaper to better articles, with increased trade for countries with a quality emphasis. While average purchasing power is low, it should not be overlooked that there are thousands of people of wealth who are able to purchase automobiles and luxuries.

Cotton cloth and yarn have led all other items in the import trade for many years, with first England and now Japan furnishing the chief supply. The quality of the imported cloth is low, although somewhat above that produced in China. Political developments and interruptions to transportation have been responsible for wide fluctuations during recent years. Chinese cotton mills are increasing in number and, with higher Customs dues since 1929, the time will soon come when the market will be largely supplied with native products. Since China is a producer of cotton, there is no necessity for permanent importation of cloth, and imports will therefore eventually consist only of special fabrics which for some particular reason may be made more advantageously abroad. Since China's purchases of cotton cloth and yarn are a vital export for Japan, a keen economic competition will doubtless ensue, made more difficult for Japan by higher and higher tariff rates. Numerous Japanese mills have been established in China within the customs wall.

The bulk of China's imports consist of manufactured goods, the preparation of which involve special technique, large-scale production, or raw materials which are not readily available in China. Chemicals and paints are an example of the first case, while cigarettes and textiles are imports produced abroad cheaply in huge quantities. Paper, chiefly for newsprint, and woolens are two imports for which the raw materials are more accessible elsewhere.

The importation of iron and steel is steadily increasing, in the form of both bars and sheets as well as in finished machines. There is little basic necessity for China to import iron except as military disturbances and poor management handicap local production. Importations of machinery, however, will doubtless increase.

The most surprising group of imports are those classed as foods, for the agricultural nature of China would suggest an adequate home production of such articles as rice, flour, and sugar. Candy and condensed milk are purchased abroad to the extent of several million taels, but this import might be explained as consisting of articles new to China. The case of rice is different. Does the import of such large amounts indicate that some sections of China are too crowded to feed themselves, or that distribution has been disturbed by military operations, or that the land is devoted to some other crop? Each of these explanations is partially true. In many provinces farmers have been forced by the military authorities to raise opium for taxation purposes, and in this way considerable areas of the best land have been removed from food production. Other cash crops such as cotton and beans have elsewhere cut down food production. China might

raise all of her own sugar, but the industry is poorly developed. The large and increasing importation of this commodity suggests new dietary habits and a rising buying power.

Cotton is imported from India and the United States to supplement local production. Cigarette tobacco is bought from the United States. In both instances China might become self-supporting with proper agricultural supervision.

Gasoline, kerosene, fuel oil, and lubricants are in increasing demand. Electric lighting may in time check the importation of kerosene, but the apparent absence of petroleum supplies in China and the rapid expansion in the use of automobiles should increase the demand for gasoline. The United States holds a commanding lead in this trade and petroleum products form one-sixth of America's total exports to China. Sumatra and Borneo are the two other sources of petroleum.)

THE BALANCE OF TRADE

For many years the value of visible imports has considerably exceeded that of exports. This so-called unfavorable balance of trade has steadily risen during recent years, increasing from 31 million haikwan taels in 1927 to 524 million in 1931, with a five-year annual average of 285 million. Large as this difference appears, it is less than a yuan per capita.

Numerous invisible elements need to be considered, for the movement of commodities is not the only factor in international economics. The Maritime Customs reports are in some measure unsatisfactory, for there is probably an undervaluation of many exports and a certain amount of smuggling. The Customs furthermore has no jurisdiction over junk trade. Very large remittances are received each year from the ten million overseas Chinese, often in silver, forwarded to relatives or as investments. These receipts come principally to Fukien and Kwangtung. American consular authorities place the figure as high as 400 million yuan, while others estimate the amount as being between 100 and 200 million.¹

Aside from merchandise and remittances, the largest remaining items of income are the expenditures in China by foreign legations, garrisons, naval ships, merchant vessels, missions, schools, tourists, and investors. These have been variously estimated as over 100 million yuan. Corresponding expenditures by Chinese legations, students, and tourists abroad amount to only 6 or 7 million. China's overseas

¹ CONDLIFFE, J. B., "China To-day: Economic," 202-203.

expenditures are for merchandise, gold and silver, foreign loan services, and remittances by foreigners.

By including these intangible items, it seems probable that China's trade is in satisfactory adjustment, the invisible imports making up for the difference in commodity flow.

GATEWAYS TO THE WORLD

The Chinese Maritime Customs maintains offices at nearly fifty ports, of which the most important are listed in Table XVIII. Most are seaports, but several are river ports and others are along the land frontier. These cities are the gateways through which China and the world meet.

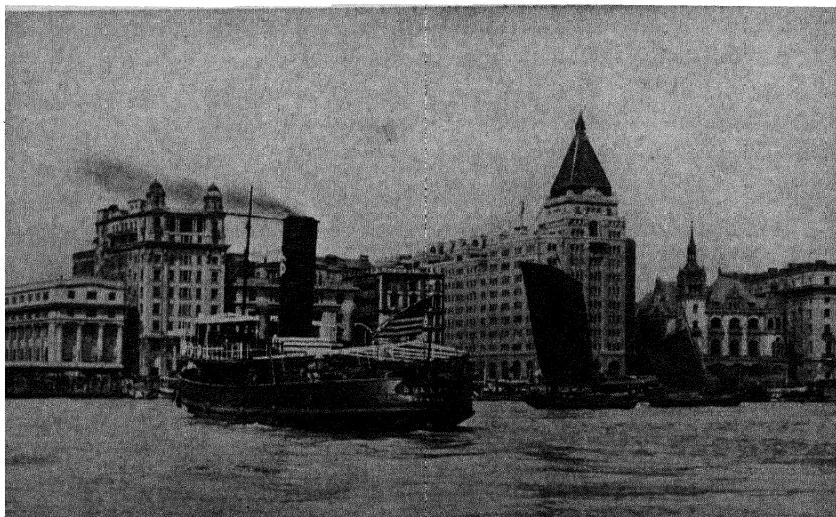


FIG. 65.—Shanghai lies on the winding Whangpoo River not far from the mouth of the Yangtze. Ships of all flags pass along the city's front door.

Shanghai easily holds a commanding lead in China's foreign intercourse, having a 1924-1928 average of 47 per cent of the imports, 38 per cent of the exports, and 43 per cent of the entire trade. In 1931 the total trade rose to 47 per cent and supplied 51 per cent of the Maritime Customs revenue. The advantage of having the capital at Nanking close to this source of income, rather than at Peiping, is obvious. Shanghai is the most cosmopolitan city in the country, with unrivaled commercial facilities and diversified industrial activity. Few countries exhibit such a vivid cultural contrast between their leading urban center and the rest of the nation.

Behind Shanghai lies the vast hinterland of the Yangtze Valley with its 200 million inhabitants. No port in the world serves so many people, and, while their buying power and output are still low, the time will inevitably come when the trade of Shanghai will be far greater than the present. The transportation links which unite the port with its tributary area are largely by water. Railways lead to near-by Hangchow and Nanking, but the bulk of the commodities move by canal boat, river steamer, or coastwise vessel.

Shanghai lies at the meeting point of two great ocean highways. One leads to Japan and across the Pacific to North America. The other extends southward to Singapore and past India to Europe. Regular sailings and tramp steamers provide adequate cargo space for shipments to all ports of the world.

The world importance of Shanghai is suggested by the volume of its shipping. The total tonnage entering the harbor during 1931 under both the General and Inland Water Regulations amounted to 21 million tons, to which should be added a large trade by native junks. This places Shanghai on an equal footing with Osaka as seventh on the list of the ports of the world in point of tonnage. The latest available data are as follows:¹ New York (1930), 31.2 million tons; London (1930), 29 million; Kobe (1930), 24.9 million; Los Angeles (1930), 22.3 million; Hamburg (1929), 22 million; Liverpool (1930) 21.3 million; Osaka (1928) 21 million; Rotterdam (1930) 20.5 million; and Hongkong (1930) 19.2 million.

The development of Manchuria may be seen in the statistics for Dairen, Antung, and the Harbin district, which also includes stations at either end of the Chinese Eastern Railway. The trade of these areas has shown a rapid rise which reflects the prosperity of the north-eastern provinces, increasing from 107 million haikwan taels or 11 per cent of China's trade for these three areas in 1913 to 524 million haikwan taels or 23 per cent in 1929, with a drop to 428 million haikwan taels and 18 per cent in 1931.

Manchuria has the most complete railway network of any section of China, and this transportation system has made possible the tremendous export of soy beans and associated by-products. Dairen and Vladivostok, at the end of the South Manchuria and Chinese Eastern Railways are the chief ports, although the ancient seaport was Yingkow at the mouth of the Liao Ho. Antung is the principal point of rail entry from Korea. Two new gateways are soon to occupy an important position. One is the harbor of Hulutao along the Peiping-Liaoning Railway on the western side of the Gulf of Liaotung, and the

¹ Inspector General of Customs, "The Foreign Trade of China, 1931," I, 25.

TABLE XVIII.—FOREIGN TRADE BY CITIES
(In haikwan taels)

Cities	1928	1929	1930	1931
Shanghai:				
Import.....	548,607,889	624,645,823	679,741,710	833,567,598
Export.....	362,920,148	364,040,891	312,667,646	277,476,440
Total.....	910,828,037	988,686,714	992,409,356	1,111,044,038
Dairen:				
Import.....	117,046,243	151,285,992	136,829,146	108,425,477
Export.....	188,359,876	237,800,064	182,943,354	213,499,973
Total.....	305,406,119	389,086,056	319,772,500	321,925,450
Tientsin:				
Import.....	112,633,629	114,068,510	104,185,112	109,352,042
Export.....	81,996,104	82,334,793	78,748,795	88,701,281
Total.....	194,629,733	196,403,303	182,933,907	198,053,323
Canton:				
Import.....	40,084,903	41,758,404	51,161,683	56,212,088
Export.....	73,337,131	75,097,383	60,366,910	61,811,221
Total.....	113,422,034	116,855,787	111,528,593	118,023,309
Hankow:				
Import.....	50,408,289	34,605,474	26,642,296	30,715,354
Export.....	27,755,677	28,008,114	18,651,138	27,119,374
Total.....	78,163,966	62,613,588	45,293,434	57,834,728
Antung:				
Import.....	44,511,907	43,019,746	33,450,378	13,696,336
Export.....	42,207,777	35,427,647	41,056,815	29,483,401
Total.....	86,719,684	78,447,393	74,507,193	43,179,737
Kowloon:				
Import.....	48,186,147	37,721,697	35,405,690	55,941,389
Export.....	14,862,047	15,877,806	17,553,235	8,392,973
Total.....	63,048,194	53,599,413	52,958,935	64,334,362
Tsingtao:				
Import.....	37,284,067	45,697,778	46,770,272	46,253,383
Export.....	26,283,242	37,285,323	42,355,262	47,980,490
Total.....	63,567,309	82,983,101	89,125,534	94,233,873
Swatow:				
Import.....	29,109,789	29,510,444	38,423,806	32,302,068
Export.....	13,591,831	15,782,156	18,013,559	14,315,932
Total.....	42,701,620	45,292,600	56,437,365	46,618,000
Harbin district:				
Import.....	27,915,479	15,752,603	16,143,792	16,026,525
Export.....	76,436,377	39,864,567	50,839,302	46,440,962
Total.....	104,351,856	55,617,170	66,983,094	62,467,487

Data from annual reports of "Foreign Trade of China" published by the Chinese Maritime Customs.

other is formed by the new railway from Changchun through Kirin to the ports of Rashin, Seishin, and Yuki in northern Korea, which are closer to Japan than is Dairen.

Tientsin is the leading port of the North China Plain. It has good rail connections leading north, south, and west and serves a far-flung

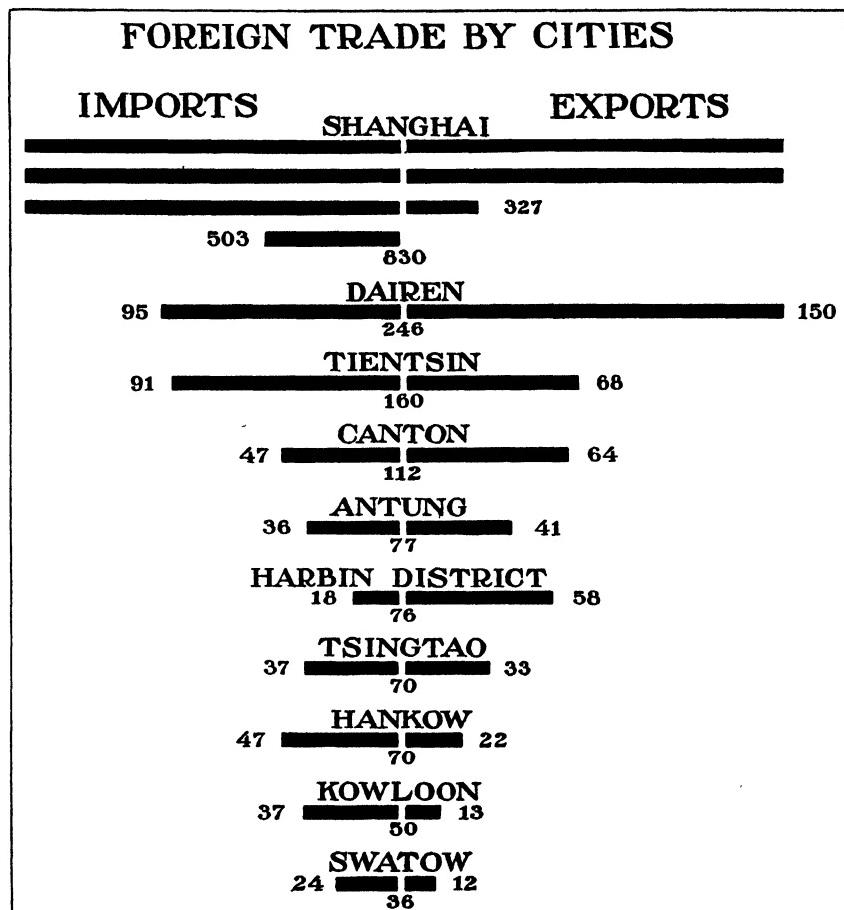


FIG. 66.—China's foreign trade by ports. All figures are in millions of haikwan taels and are the average of 1924 to 1928.

section of inner Asia, extending into Mongolia and Sinkiang. Unfortunately the city is located on a winding silt-laden river with poor harbor facilities. Under the circumstances a considerable part of the commerce of the Plain moves through Tsingtao which has one of the best harbors in northern China. Chefoo is an important rival of Tsingtao but is without rail connections.

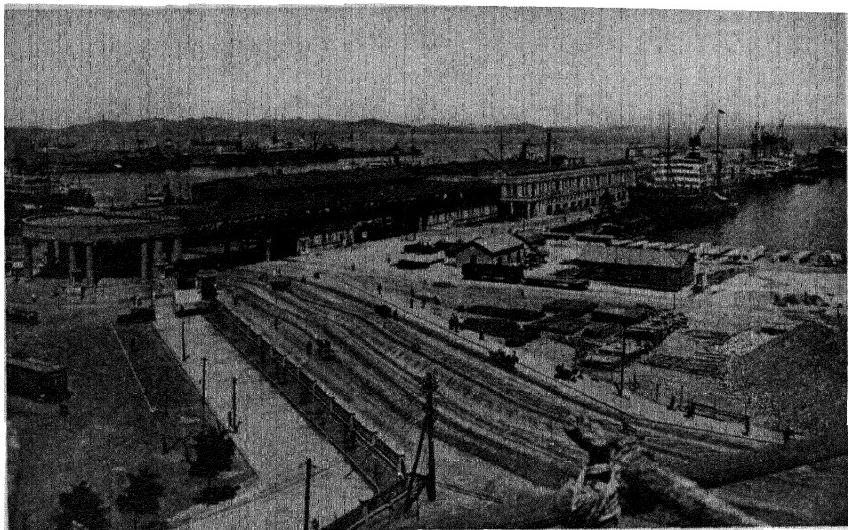


FIG. 67.—Dairen is equipped with the most modern wharves and terminal facilities of any city in China. (*South Manchuria Railway.*)

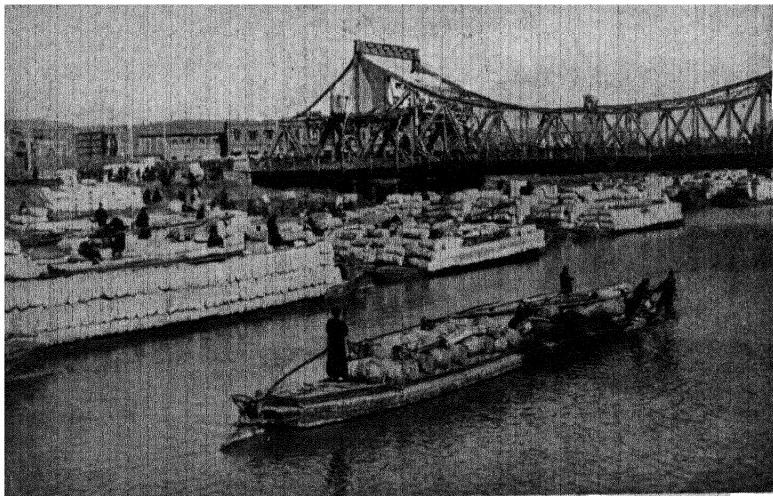


FIG. 68.—River boats discharging native cotton at Tientsin. (*U. S. Bureau of Foreign and Domestic Commerce.*)

Canton is the leading Chinese port of the South but is inadequately provided with harbor facilities and is dependent upon transhipment at Hongkong for most of its overseas trade. The completion of the railway to Hankow may divert a certain amount of Yangtze Valley trade with Europe which now passes through Shanghai to Canton. The development of trade in the Canton area has been handicapped by disturbed political events in the hinterland and by interruptions in the relations with Hongkong. Kowloon is on the mainland opposite the island of Hongkong and is the terminus of the railway to Canton. Three other ports along the southern coast deserve mention: Swatow, Amoy, and Foochow. The first two have good harbors but each has only a limited and mountainous hinterland.

Hankow, 600 miles west of Shanghai, is the principal port of entry on the middle Yangtze, and small ocean vessels reach the city throughout the year. During the summer months when the river is high, it is not uncommon to see a dozen seagoing vessels loading cargoes in the heart of China for shipment to Europe or America.

The ten customs centers listed in Table XVIII handled 90 per cent of the entire foreign trade in 1931. The following list includes all other cities whose 1931 trade exceeded ten million haikwan taels: New-chwang (Yingkow), Amoy, Chefoo, Lappa, Chinwangtao, Foochow, Kongmoon, Mengtsz, Wuchow, and Nanking.

CHINA'S COMMERCIAL NEIGHBORS

More than two-thirds of China's direct foreign trade is with six countries, statistics for which are shown in Table XIX (page 152).

Since Hongkong is not in itself a large producer or consumer, the imposing figures for that colony largely represent goods in transit. The British colony is a free port and the absence of customs dues combined with political security and strategic location have caused Hongkong to become a distributing center of great significance, especially in the early days when a single *entrepôt* was needed. Before a true picture of China's trade may be obtained, it is necessary to unscramble the commerce of Hongkong and allocate it to the proper countries of origin or destination.

Trade statistics of approximate accuracy are available for 1919, 1924, and 1930 but are somewhat incomplete, especially for junk trade with near-by Chinese ports. It is significant that Hongkong's total foreign trade declined more than 50 per cent in twenty-one years, while China's trade in the same two decades increased 50 per cent. This decline is partially political but also reflects the rise of purely

TABLE XIX.—FOREIGN TRADE BY COUNTRIES
(In haikwan taels)

Countries	1928	1929	1930	1931
Japan including Formosa and Korea):				
Imports.....	335,421,586	338,805,564	341,199,380	306,487,265
Exports.....	277,175,374	296,212,165	260,729,749	294,587,100
Total.....	612,596,960	635,017,729	601,929,129	601,074,365
Hongkong:				
Imports.....	226,077,171	214,481,099	218,369,933	222,076,628
Exports.....	182,123,992	173,580,754	158,018,135	148,311,538
Total.....	408,201,163	388,061,853	376,388,068	370,388,166
United States:				
Imports.....	205,541,351	230,843,677	232,405,941	321,341,671
Exports.....	127,204,573	137,836,287	131,880,076	120,204,774
Total.....	332,745,924	368,679,964	364,286,017	441,546,445
Great Britain:				
Imports.....	113,756,588	119,148,969	108,257,932	119,985,583
Exports.....	61,063,733	74,384,237	62,669,051	64,525,890
Total.....	174,820,321	193,483,206	170,926,983	184,511,473
Germany:				
Imports.....	55,696,970	67,075,824	69,105,357	83,514,454
Exports.....	22,824,561	22,457,702	23,361,413	23,138,349
Total.....	78,521,531	89,533,526	92,466,770	106,652,803
France:				
Imports.....	21,579,338	18,185,138	16,986,885	21,683,949
Exports.....	72,040,694	56,319,131	42,699,749	34,111,338
Total.....	93,620,032	74,504,269	59,686,634	55,795,287

Data from annual reports of "Foreign Trade of China" published by the Chinese Maritime Customs.

Chinese ports along the southern coast, and the shift of commerce and industry to Shanghai.

In 1911–1915 Hongkong accounted for 28 per cent of China's entire trade, but by 1926–1930 the share had dropped to 16 per cent, and in 1932 to 9 per cent. Hongkong has lived almost entirely off its business of transhipping Chinese trade; now that it is losing this means of livelihood, what will it do? In similar fashion, an appreciable share of Japan's trade with China has also consisted of transhipments.

Still another complicating factor in analyzing China's trade relations arises in the case of Japan and Canada, which serve as reship-

TABLE XX.—HONGKONG'S FOREIGN TRADE
(In United States dollars, 000 omitted)

Country	Imports			Exports		
	1919	1924	1930	1919	1924	1930
China.....	43,805	40,421	57,916	214,993	175,584	88,958
Indo-China.....	63,955	48,340	18,739	30,694	22,586	14,286
Japan.....	45,921	40,315	25,051	46,772	15,566	7,702
United States.....	41,033	26,127	16,038	23,188	10,994	6,863
Great Britain.....	24,368	41,741	24,043	12,832	3,290	1,525
Siam.....	22,651	27,604	12,440	7,565	7,597	8,058
Netherland India.....	14,093	41,777	22,258	11,021	4,660	4,599
India.....	39,207	13,512	6,885	13,879	5,371	6,885
Malaya.....	15,243	7,478	4,815	22,005	12,783	11,382
Total.....	373,595	318,716	217,452	417,154	281,243	168,219

Data from JANET H. NUNN, "Analysis of Hong Kong Trade for 1924 and 1930," Washington: Bureau of Foreign and Domestic Commerce, Special Circular 233—Division of Regional Information (1931).

ment points for considerable commerce with the United States. American goods are frequently forwarded to or from Vancouver, while Japanese firms are the agents for large quantities of materials destined for Manchuria and other parts of China. Unfortunately the net result is not known, but it is a very considerable figure.

With these conditions in mind, it is possible to suggest the general distribution of China's foreign trade. Japan appropriately comes first. This condition is a natural result of her geographic proximity, her deficiency in raw materials, and her expanding industrialism. Trade with China is a vital element in Japan's economic structure, so that the creation and preservation of good will should be the corner stone of her foreign policy. The volume of Chinese exports to the United States which pass through Japan is limited, but imports passing through Japan, such as railway equipment, machinery, and raw cotton, amount to several million taels and must be deducted. On the other hand, the trade of Japan through Hongkong is largely with China, so that an addition is necessary which may equal or possibly exceed the deduction for imports credited to Japan but in reality originating in the United States. The actual trade of China and Japan may therefore have been somewhat greater than the 504 million haikwan taels' average for the years 1924 to 1928. This represents 23 per cent of China's total foreign business, so that it may be safe to credit Japan with one-fourth of China's entire trade in normal years. Despite political complications, the visible total rose to 26 per cent in 1931.

This total is made up largely of cotton cloth, electrical goods, and other manufactured products from Japan, and exports of raw cotton, beans, and minerals.

The increase of commerce with the United States has been phenomenal, for the total of the direct trade has risen from 39 million haikwan taels in 1913 to 442 million in 1931. If the indirect trade be included, the increase is even greater, for a very considerable volume of trade credited to Japan consists of American products *en route*

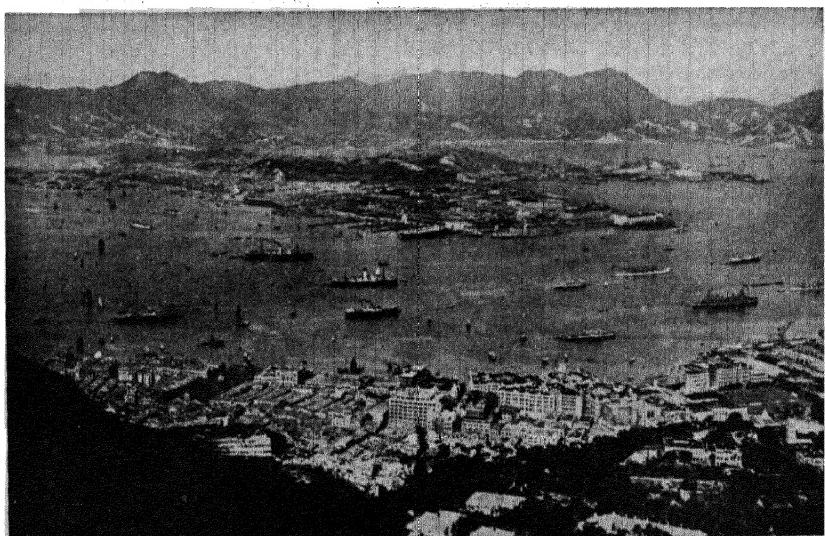


FIG. 69.—The British colony of Hongkong is the great distributing port of South China and is supplied with a magnificent harbor. The city of Victoria appears in the foreground, with Kowloon in the distance. (*Brewer and Company*.)

to China, while the statistics for Hongkong show that a large trade passes through that port. One of America's largest purchases from China is raw silk from the Canton area, all of which is shipped through Hongkong. Imports from the United States are made up of petroleum products, wheat, cotton, tobacco, and machinery. The statistics of the Chinese Maritime Customs for the direct trade from 1924 to 1928 average 14 per cent, rising to 19 per cent in 1931, but the extent of the indirect trade is considerable. Even without this, the United States rose to the leading position in imports for 1931, surpassing Japan for the first time. It has even been suggested that the United States is about to take first place away from Japan in both exports and imports, but this appears doubtful. It is probably conservative to

estimate that America's sales and purchases normally amount to about one-fifth of China's total overseas trade.

China's third market and supply area consists of the region collectively referred to as the South Seas, or Nan Yang. The millions of Chinese who have emigrated to the Straits Settlements, Indo-China, Siam, Java, and the Philippines form a very important market, from whom in turn China makes large purchases. Trade, of course, is not confined to the Chinese themselves. Sales consist of silk and cotton cloth, cigarettes, Chinese foods, and other articles of simple manu-

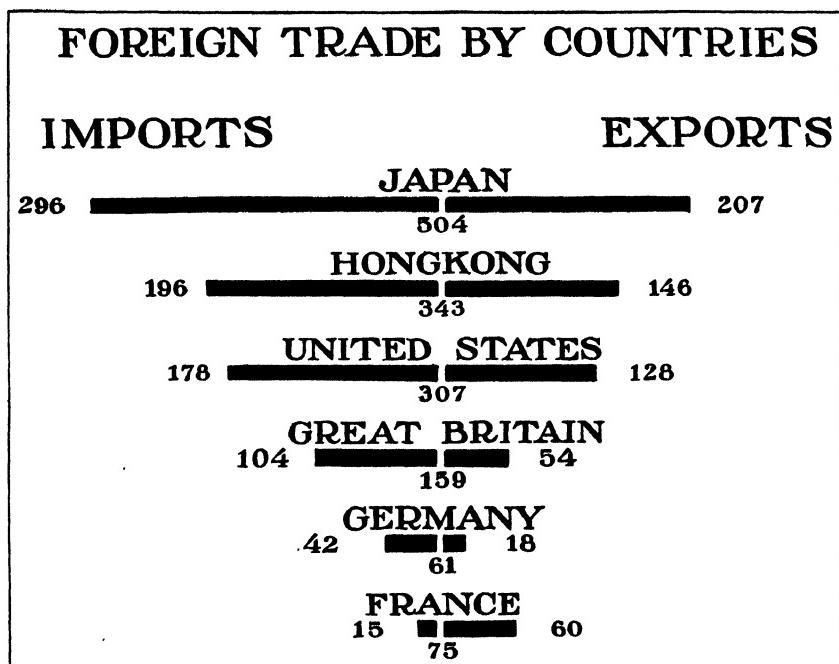


FIG. 70.—China's foreign trade by countries. All figures are in millions of haikwan taels and are the average of 1924 to 1928.

facture. Return cargoes are petroleum, sugar, rice, and tropical products. Hongkong is the center of this trade and the statistics for the year 1930 reach the figure of approximately £25,000,000 for the Straits Settlements and Federated Malay States, Netherland India, French Indo-China, and Siam. This figure represents the surprising total of nearly 200 million haikwan taels, almost all of which should be credited to China. To this must be added the direct trade from Canton, Swatow, Amoy, and Shanghai. For the same year, the reports of the Chinese Maritime Customs show a total trade of 143 million haikwan

taels with these countries. The entire trade with the South Seas may thus represent one-sixth of China's foreign trade.

The position of England in China's trade is materially better than the figures credited to Great Britain alone would indicate, for Hongkong is the natural gateway for British goods. In 1931 Great Britain apparently took fourth place in China's foreign trade, with 8 per cent. To this must be added the large shipments via Hongkong. China buys about twice as much from the United Kingdom as she sells, purchases

FOREIGN TRADE BY 'SHIPS

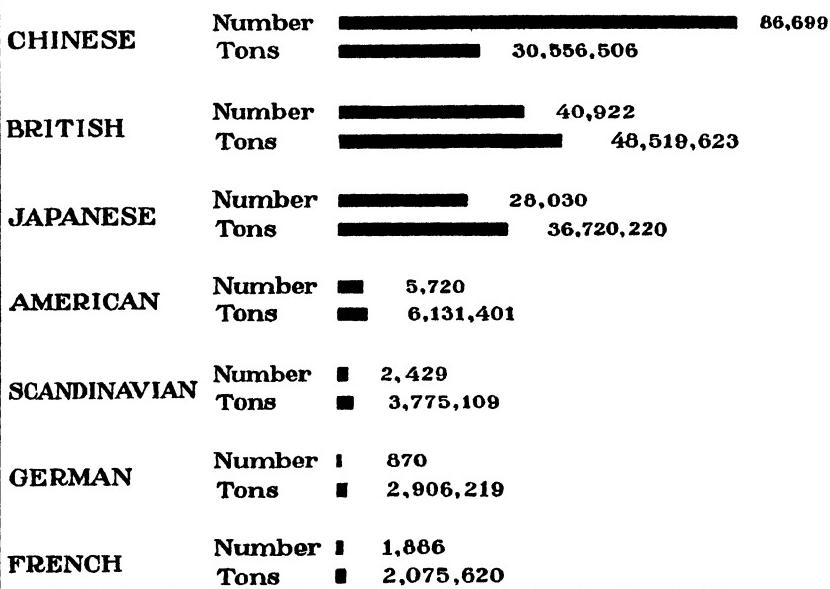


FIG. 71.—The nationality of shipping entering Chinese ports. Figures represent the average of 1924 to 1928.

consisting chiefly of textiles and machinery. The latest year for which Hongkong statistics are available is 1930, and in that year the total volume of China's trade with the United Kingdom, both direct and via Hongkong, amounted to about 11 per cent of the entire foreign trade. Great Britain may thus be credited with one-eighth of China's trade.

Germany and France complete the list of the important countries which have commercial relations with China. The former has more than regained her prewar position and is bending every effort to increase her sales of chemicals, scientific goods, electrical apparatus, and

machinery. France is a purchaser of raw silk and sells chiefly artistic goods, such as perfumes and clothing. Neither country has more than 5 per cent of China's trade. Russia was at one time a large purchaser of Chinese tea, but the trade between the two countries has been negligible since the World War.

The distribution of foreign trade by ships is indicated in Fig. 71. Although Chinese vessels greatly outnumber all others, they are mostly small, so that British and Japanese ships exceed in tonnage.

CHAPTER VII

THE NORTH CHINA PLAIN

THE GIFT OF THE RIVERS

(The North China Plain is the gift of the Hwang Ho, or Yellow River, and the other streams which flow out from northwestern China.) Not long ago, as geologists measure time, this great plain was an arm of the sea whose waves beat against the Shansi mountains. Shantung was then an island, and the fertile fields of the present plain

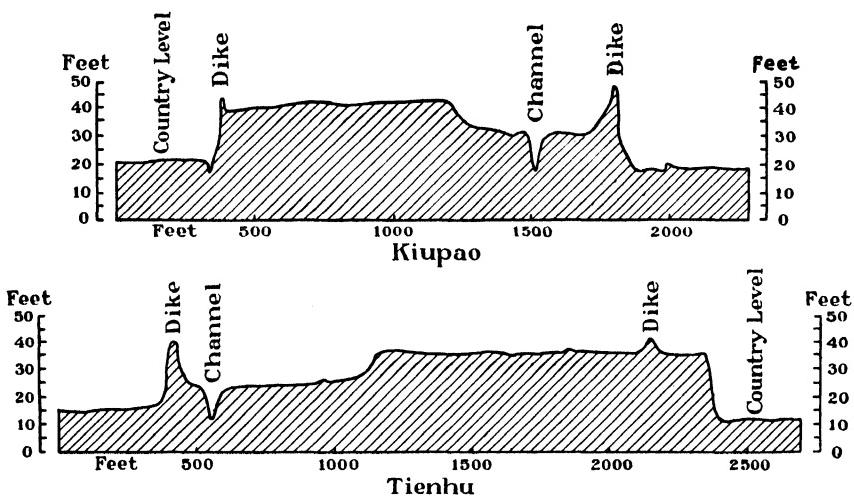


FIG. 72.—These cross sections of the Hwang Ho show how the bed of the river has been built above the level of the surrounding country. (*Surveys by the American Red Cross.*)

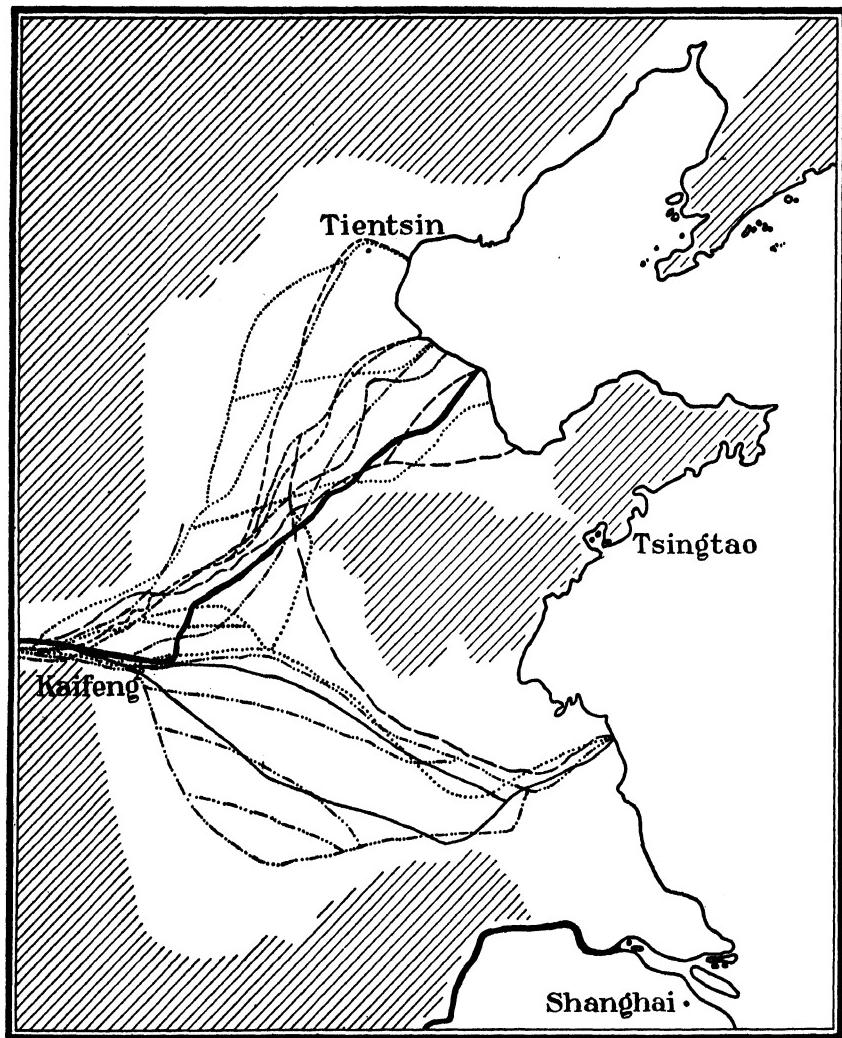
were as yet unformed. Just as the Hwang Ho today pours out its silt into the Yellow Sea, or Hwang Hai, so it has for countless ages in the past. When the ancient Yellow Sea covered Hopei and Honan, the mouth of the Hwang Ho was west of Kaifeng and there deposited its burden of sediment, washed down from the loess-covered hills of the west and from the distant mountains of Tibet. Gradually the delta grew. As one section of the shallow sea became filled, the mouth of the river shifted.

So great is the load carried by these rivers from the western highlands, and so flat is their course as they wander over this plain of their own building, that they are not able to carry all their burden to the sea and drop part of it along the way. Thus the rivers, by continuously depositing their surplus load, build up their beds. In time, the channels become filled with sediment above the level of the surrounding land, and the courses of the rivers are deflected to the lower ground on either side. To prevent this, men have built great embankments to keep the rivers in their channels. As a result, newer and higher dikes are continually needed, but to no avail, for the river always wins in this one-sided contest. The silt, which nature intended to be spread over a wide area, is confined between artificial walls. The result is that many of the rivers flow on the tops of broad ridges rather than in normal valleys. Would that the dwellers of the North China Plain had heeded the sound advice of the great Li Ping, engineer of the irrigation system of the Chengtu plain in Szechwan, two thousand one hundred years ago: "Dig the channel deep, keep the dikes low"!

When man relaxes for a few years or becomes careless in his dike supervision, a flood is sure to break through with resulting disaster. Thousands of square miles have occasionally been flooded with little chance of drainage, and millions have been drowned. Those who escape death by the waters die by famine or are at least impoverished and weakened by privation. No wonder that the Hwang Ho, the most changeable of these rivers, is called "China's sorrow."

The Hwang Ho has many times shifted its course, and its mouth has been first to the north and then to the south of the Shantung Peninsula. Prior to 1852 it entered the ocean south of Shantung, while today it flows to the north and reaches the sea 250 miles from its former outlet. These changes illustrate the manner in which the great plain has been formed. Throughout much of the plain the elevation is less than 200 ft., but in the region where the Hwang Ho pours out from the mountains, so much sediment has been laid down that the elevation is considerably greater. Thus where the Peiping-Hankow Railway crosses the Hwang Ho near Chengchow 400 miles from the sea, the river has an elevation of 400 ft.

But the North China Plain is not always a land of flood and famine. These same floods that bring a curse today have been a blessing in the past. To them belongs the credit for the broad fertile fields which for thirty or forty centuries have been the home of one of the world's most industrious peasantry. Who can count the people who have lived on this soil? With a population of eighty million today, the total number



LEGEND

- Course of the Hwang Ho from the great flood of B.C. 2297 down to B.C. 602
- - - Course during the third century B.C.
- - - Channels during the Tang and five succeeding dynasties, from A.D. 70 to A.D. 1048
- - - Course during the Sung Dynasty, 1048 to 1194
- - - Course during the Kin Dynasty
- Courses under the Yuen, Ming and Manchu Dynasties from 1280 to 1851
- Present channel
- / \ Mountains

FIG. 73.—Changes in the course of the Hwang Ho. It is also possible that at one time the Hwang Ho emptied into the Yangtze. [After Pampelly from Chin Hu Wei in the *Yunkungchuchi* (Peking, 1705).]

who have come from its dust and thereto returned may have numbered a trillion souls.

Here is a rich and fertile land, a land of vast antiquity and romance, the scene of dynasty upon dynasty, one of the most intensely used regions of its size on earth. How does man live, how does he use the gifts of nature, what are his difficulties, and what of the future? All these are the problems of geography, for the task of this newest of sciences is to interpret the earth in terms of human use.

THE HUMAN PANORAMA

This vast plain teems with human activity. Everywhere people are busily at work in the fields. Man's intimacy with nature is vividly portrayed by Count Keyserling.¹

"Never before have such impressive pictures of country life been unfolded before me as on this journey through inner China. Every inch of the soil is in cultivation, carefully manured, well and professionally tilled. . . . The villages, built of clay and surrounded by clay walls, have the effect of natural forms in this landscape: they hardly stand out against the brown background. And wherever I cast my eyes, I see the peasants at work, methodically, thoughtfully, contentedly. It is they who everywhere give life to the wide plain. The blue of their jerkins is as much part of the picture as the green of the tilled fields and the bright yellow of the dried-up river beds. One cannot even imagine this flat land devoid of the enlivening presence of these yellow human beings. And it represents at the same time one great cemetery of immeasurable vastness. There is hardly a plot of ground which does not carry numerous grave mounds; again and again the plow must piously wend its way between the tombstones. There is no other peasantry in the world which gives such an impression of absolute genuineness and of belonging so much to the soil. Here the whole of life and the whole of death takes place on the inherited ground. Man belongs to the soil, not the soil to man; it will never let its children go. However much they may increase in number, they remain upon it, wringing from Nature her scanty gifts by ever more assiduous labor; and when they are dead, they return in childlike confidence to what is to them the real womb of their mother. And there they continue to live forevermore. The Chinese peasant, like the prehistoric Greek, believes in the life of what

¹ KEYSERLING, HERMAN, "The Travel Diary of a Philosopher," II, 70-71.

seems dead to us. The soil exhales the spirit of his ancestors; it is they who repay his labor and who punish him for his omissions. Thus, the inherited fields are at the same time his history, his memory, his reminiscences; he can deny it as little as he can deny himself; for he is only part of it."

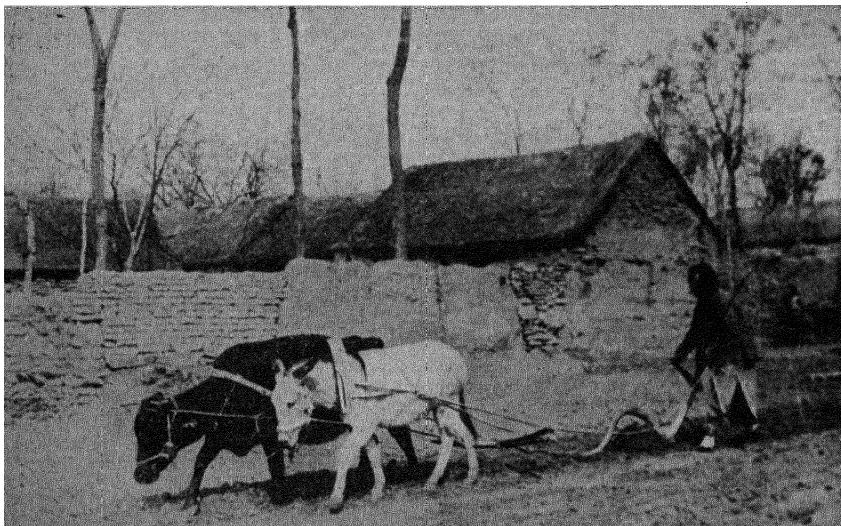


FIG. 74.—Draft animals, wooden implements, walls of pounded earth or sun-dried bricks—such are the typical features of the Plain. (*The Photo Bureau*.)

Throughout the region there is a striking unity in the cultural pattern. Details of agriculture may vary from community to community, but one may travel for hundreds of miles and see only the same monotonous landscape. There are no mountains to relieve the flatness of the plain and the bankless rivers wander aimlessly. The levelness is relieved only by the ever-present grave mounds and farmsteads. The same pattern of tiny fields is repeated over and over again. A traveler by aeroplane would find little by which to guide his flight. The winding sandy river courses all look alike; so do the innumerable villages.

The region is characteristically brownish yellow and dusty. Houses, walls, and even roofs are of the same mud as the fields. The famous dust storms, so well known in Peiping but typical of the whole region, mantle crops and people with their yellowness. Agricultural implements and domestic utensils share this yellow dust; even the trees become yellow. The rivers, too, are yellow, as is the sea into which they flow. Even the tiles on the palace roofs in Peiping gleam with yellow, the Imperial color.

The North China Plain has been the meeting ground for many different races. During the historic period there are records of frequent invasions from Mongolia, Manchuria, and the west. Many times the "barbarians of the north" pushed into the rich agricultural plain from their nomadic lands behind the mountains. With each invasion there was a mixing of the races, and eventually the newcomers were assimilated by the Chinese.



FIG. 75.—“There is no other peasantry in the world which gives such an impression of absolute genuineness and of belonging so much to the soil.”—Keyserling. (*China International Famine Relief Commission*.)

Doubtless many of these invasions were associated with climatic changes in central Asia, for a shortage of rainfall in these arid regions may well have caused the nomadic inhabitants to press out into the somewhat moister borderlands. Preliminary studies suggest that there has been a rough correlation between variations of rainfall in central Asia and the invasions of China. For nearly half of the past fifteen hundred years of her history, China has been under Tartar dynasties. It has commonly been assumed that these conquests have been due to

internal decay, but the fact has usually been overlooked that the decline of the purely Chinese dynasties has been associated with times of drought, famine, and other climatic misfortune. These same factors which have brought distress to the North China Plain have been the spur which have started the nomads toward the lands south of the Wall, which, though devastated, appeared attractive to the dwellers of parched deserts.

As a result of both famine and invasion, part of the Chinese have been forced to migrate southward, and in many cases it may have been the more vigorous elements which have gone. As a result, Ellsworth Huntington has suggested¹ that the cycle of Cathay has consisted of, first, a period of dryness in Central Asia, followed by the invasions of nomadic warriors. These newcomers brought fresh blood and vigor; and, as a result of the mixture of these somewhat more virile races, there followed as the third stage a period of progress and expansion. Owing, however, to recurring dryness and the decadence of the ruling class, there followed a time of stagnation. This fourth phase brought on the fifth, namely, a period of decline.

The anthropological history of the North China Plain seems to have been marked by a supply of vigorous elements from the north, and a drain of the more ambitious members to the south. The Great Wall was constructed and renewed during times of distinctly Chinese dynasties in order to keep out the barbarians, but walls and armies have never successfully prevented these dramatic invasions.

(The present inhabitants of the North China Plain are the result of a complex racial history. Although weakened by migration and famine, they have been strengthened by a mixture of new blood and sustained by a stimulating climate. They are today taller, more vigorous, and hardier than the inhabitants of the South, who, more nearly than they, may represent the original Chinese.)

On this fruitful plain lives a multitude of people. The 1926 Post Office estimates, recomputed by hsien, give a total of 80,979,025. This is an average of 647 people per square mile (250 per square kilometer).²

BOUNDARIES

The North China Plain is one of the most clearly defined geographic regions in Asia. On all sides the boundary is distinctly marked, except on the southeast where there is a gradual transition to the

¹ HUNTINGTON, ELLSWORTH, "The Character of Races," 148 ff.

² Detailed statistical information for this and other regions will be found in the Statistical Summary, Table XXXVI, in the back of the book.

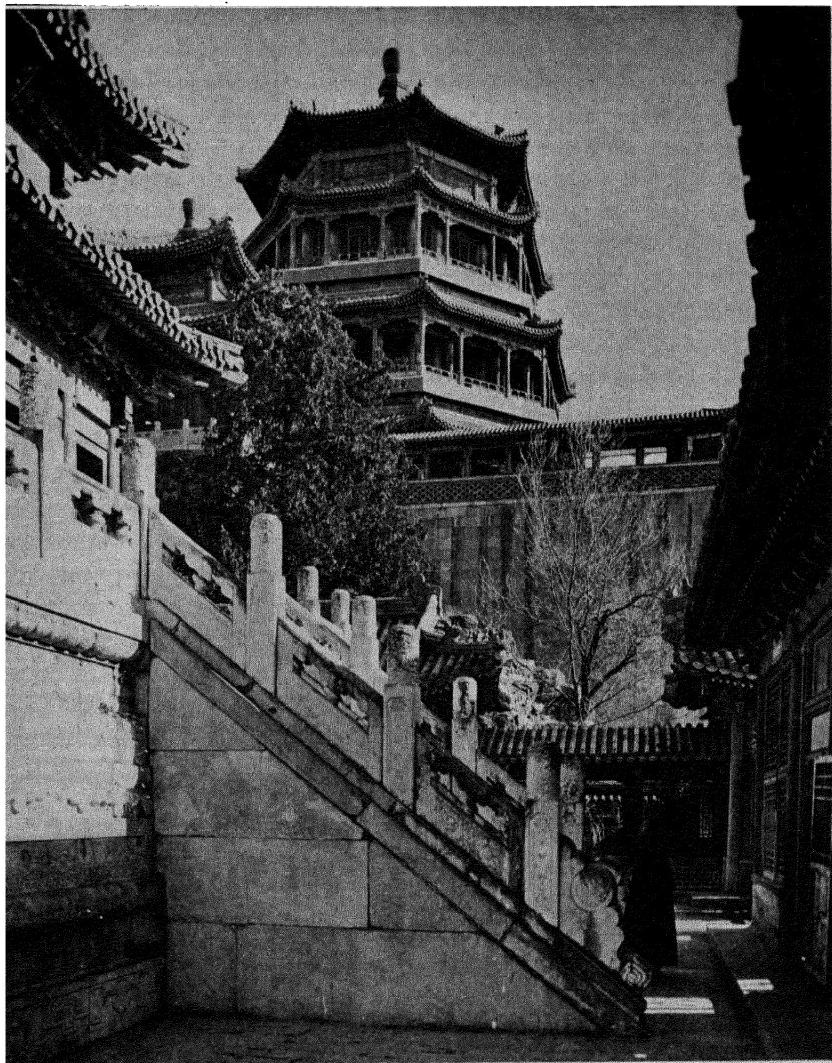


FIG. 76.—Chinese architecture reaches its climax in the Summer Palace outside Peiping. Marble balustrades, yellow roof tiles, lattice windows, and lacquered columns make this a scene of rare beauty. (*L. Green from Publishers Photo Service.*)

Yangtze Plain. To the east the plain is limited by the sea and elsewhere is sharply bounded by encircling mountains of old hard rocks which rise abruptly above the flat plain. A few isolated hills here and there extend beyond the mountain front, but in most places a single photograph can clearly show both mountain and plain.

On the northeast, the North China Plain begins at Shanhakwan where the Great Wall commences its winding course from the Pacific to the edge of Tibet. Here the mountains almost meet the sea, and the plain is but a narrow strip of land five miles in width. Northward the plain continues to Manchuria and forms the principal avenue from the ancient home of the Manchus to historic China. Shanhakwan is China's Thermopylae, and on this narrow plain countless battles have been waged for thousands of years.

Southward from Shanhakwan the boundary recedes from the coast and near Lwanchow turns west past the Eastern Tombs to the Peiping embayment. North of Peiping are two passes, Kupeikow leading to Jehol and the famous pass at Nankow through which have passed caravans to Mongolia, and under which in a tunnel now runs the Peiping-Suiyuan Railway. Near here at the edge of the plain are the Ming Tombs, while farther south are the Western Tombs, outlying jewels in the beauty of Peiping.

Southward from Peiping the margin of the plain is west and generally within sight of the Peiping-Hankow Railway. The railway has taken advantage of the physiographic setting and has been built where it may receive both the agricultural products of the level land and the mineral resources of the near-by Shansi mountains. Wise counsel located the railroad here, for these mountains to the west contain the richest deposits of coal in China.

In the vicinity of the Hwang Ho the plain extends westward along the left bank of the river to a point north of Loyang where the boundary crosses the river and turns back to Chengchow. There is little level land south of the Hwang Ho and west of Chengchow in contrast to the wide plain to the north. South of Chengchow the limits of the plain continue to be west of the Peiping-Hankow Railway but are irregular and ill defined. The hills are lower, and large areas of level land extend westward among them. One such area is southwest of Hsuchow. The first hills east of the Peiping-Hankow Railway are at Kioshan, but the physiographic boundary keeps west of the railroad to near Hwangshanpu.

North of Sinyang the country becomes hilly and the railroad enters the Central Mountain Belt. The limits of the plain turn eastward some distance to the north of this city and follow along the edge of the

Hwaiyang Mountains which extend across Anhwei. The southern margin of the alluvial area is along the valley of the Hwai Ho, which topographically belongs with the dry millet and kaoliang region to the north. Due, however, to higher rainfall, more favorable temperatures, and different soils, a significant change takes place in land utilization. North of the river the soil is sandy and consists of the deposits of the ancient Hwang Ho, laid down when it wandered to the sea south of Shantung. South of the Hwai Ho the soil has been brought from the tree-clad hills of the Central Mountain Belt and is finer and contains more clay. As a result, the southern valley of the Hwai Ho is rice land and similar in all essential respects to the Yangtze Plain. For this reason the southern Hwai Valley in Anhwei and Kiangsu is excluded from the North China Plain, and the boundary is placed slightly north of the river. In northern Kiangsu the boundary passes through the shallow Hungtze Hu. The cities of Tsingkiangpu and Hwaian mark the limit of rice cultivation in Kiangsu, and the boundary extends from here eastward to the sea.

The province of Shantung is equally divided between plain and mountain. The mountains were once an island mass in the sea but have now been half surrounded by the advancing delta of the Hwang Ho. In the center of the peninsula a depression extends nearly across the mountains and forms a natural opening for the railway from Tsingtao to Tsinan. This trough almost divides the mountains of Shantung into two sections, so that the North China Plain reaches to within a few miles of Tsingtao. The boundary of the plain commences near Laichow in northeastern Shantung and extends southward in an irregular line nearly to Kiao Chow. From here it swings northwest and then west and lies just south of the railroad to Tsinan. The Shantung railway, like the Peiping-Hankow, carries both coal and iron from the mountains and agricultural products of the plain.

Southwest from Tsinan the boundary is near the Hwang Ho as far as the Grand Canal, where the limits of the Plain turn to the southeast, past Kufow, the home of Confucius. The boundary continues in this direction to near Ihsien; eastward from here the plain fingers up into the mountains around Ichow and reaches the sea just north of Haichow.

The area of the North China Plain is 125,078 sq. miles (324,036 sq. km.).

THE DEPENDENCE UPON SOIL AND WATER

The earth from which man has grown is not everywhere the same. The surface of the plain is a mixture of river-laid alluvium and wind-

deposited loess, blown up from the flood plains and dry fields and in part brought from the Loess Highlands. In some sections there are

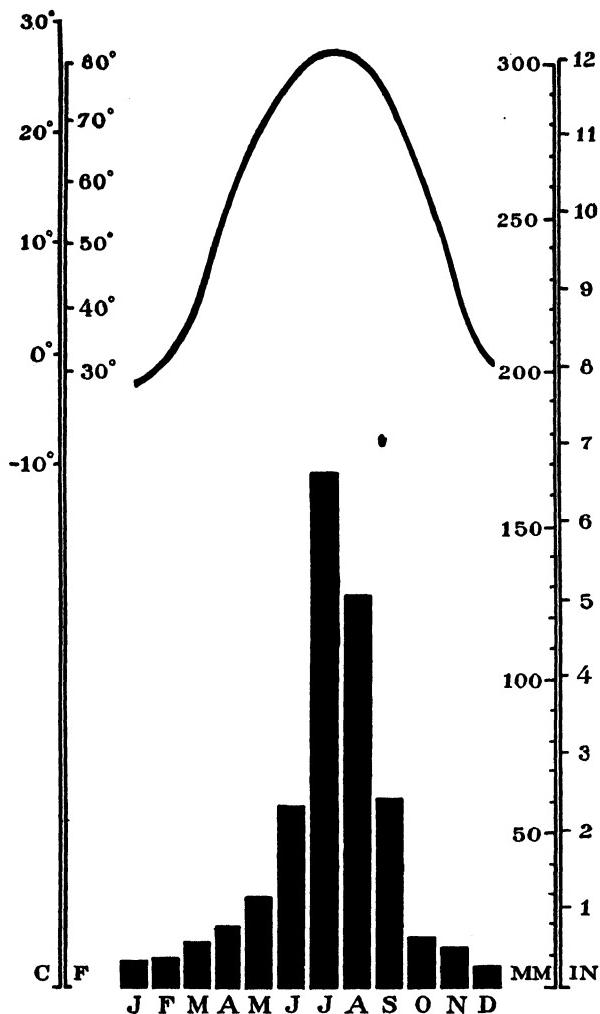


FIG. 77.—Climatic conditions in the North China Plain. Rainfall averages based on Tientsin (average annual rainfall 509 mm.), Fukow (678 mm.), Nansuchow (500 mm.), Paoting (381 mm.), and Taming (536 mm.). Temperatures for the same stations omitting Paoting. Full data for this and subsequent regional graphs will be found in Tables III and IV.

long stretches of sandy soil which mark the course of some ancient river. Elsewhere the soil may be saline, a product of the excessive evaporation. A white efflorescence of sodium chloride and sodium

sulphate appears on many surfaces when dry. In most of the area the soil retains a fertility which has not been entirely robbed by centuries of cultivation. Throughout the region and at all depths the soils are calcareous. Owing to the flatness of the area and the high water table, drainage is poor. This is especially true in certain low interstream basins.

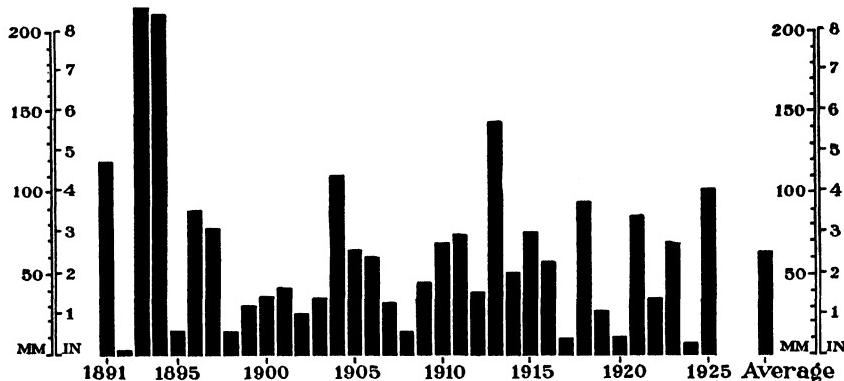


FIG. 78.—Average June rainfall at Tientsin. Planting cannot take place until after the spring rains, and if they are delayed after this month, crop failures are inevitable. Here is a clue to the precariousness of agriculture.

The soil is more or less a constant, but the weather is not! Man lives on the earth, but his life depends even more on the atmosphere. With adequate rain, the land produces rich harvests; without it the Plain is a parched semidesert. Rainfall is the key to prosperity. Each village has its rain god, and tablets which are supposed to bring precipitation are found in many temples.

The average precipitation for the entire region is but 521 mm. (21 in.), ranging from slightly more in the south to less in the north. This amount is not only precariously low but is subject to wide fluctuations, in both amount and time. Droughts in May and June are especially serious.

Too little rain means crop failure and famine, while excessive rain brings flood and also famine. Often the rainfall is so concentrated that the otherwise dry watercourses overflow and great shallow lakes develop in the interstream depressions. Since the land is so flat, drainage is slow and these water bodies may remain for months. For protection against such floods many farmhouses are built on mounds raised five to ten feet above the general level of the plain. The traveler during the winter may wonder at the presence of boats far from navigable waterways with not even a pond in sight. Should he return

in the late summer of a flood year, he may see these same boats in use for harvesting crops partially submerged beneath a vast, though shallow, expanse of water.

Temperatures are influenced by the interior of the continent during the winter and by the ocean in the summer. In winter the cold winds from Central Asia bring no moisture but rather dry up the land, giving it a brown and parched appearance. The winters have temperatures down to 0°F. (-18°C.), with bitterly cold winds. The absence of clouds fortunately enables the sun to moderate the temperature somewhat. In the spring the wind changes and the southwest monsoon brings warm and moist air from the sea. With the arrival of summer and the June rains, vegetation springs up and the brown land becomes green. The countryside which had seemed deserted during the winter now teems with activity in the supremely important contest for food.

Summer temperatures are high and almost every year the thermometer rises to 100°F. (38°C.). The sun blazes down with a fierceness which only those born to the land can endure. Despite the extent of the North China Plain, the differences in temperature from one point to another are not marked. The south, especially in Kiangsu and Anhwei, is somewhat warmer than the north in winter, but the summer conditions are quite uniform throughout the entire region.

AGRICULTURAL ACTIVITIES

Soil is the greatest resource of the North China Plain. Wherever conditions permit, the land is carefully tilled. Agricultural methods do not require the extreme amount of hand labor necessary in South China, although the intensity is high when compared with practices in Europe and America.

Mules, donkeys, and oxen are usually employed for plowing the larger fields, but vegetable gardens are often spaded by hand. All agricultural implements are made by local carpenters and blacksmiths. The plows are small and inefficient and are of wood, except for a small iron tip which does not dig deeply into the soil.

On account of the cold weather and low rainfall, little cultivation is possible during the winter. Winter wheat is raised in Shantung and south, but in Hopei agriculture is limited to one crop a year. "Three harvests in two years" is the way the Chinese describe the cropping practice. Irrigation is uncommon and most of the crops are grown on dry fields. Hand-operated wells provide water for vegetable gardens.

This fertile plain is a region of wide diversification in crops, as many as a dozen or more varieties being raised by a farmer during the year. This lessens the risk of crop failure, distributes work and income, and provides a varied diet. One-quarter to one-half of the land is sown to winter wheat in October, the amount being greater in the south. Barley and beans are also winter crops. Kaoliang is the leading spring-planted crop, amounting to about one-seventh of the area in most localities. Millet is slightly less important, although locally it may exceed kaoliang. Cotton and hemp are scattered widely. Summer cropping consists of corn, millet, soy beans—sometimes interplanted with either corn, kaoliang, or millet—sweet potatoes, peanuts, and sesame. Tobacco is locally important. Garden vegetables include Chinese cabbage, several kinds of beans, peas, carrots, and Irish potatoes. Fruits are limited and consist chiefly of hard pears, persimmons, and melons.

Estimates of cultivated land collected by the former Peking Ministry of Agriculture and Commerce give 27 mow ($4\frac{1}{2}$ acres) of cultivated land per farm family within the limits of the geographic region. This may be compared with results of surveys in seven localities in Anhwei, Hopei, and Honan by J. Lossing Buck which average 47 mow, and the figures of the Nanking Directorate of Statistics for the provinces of Hopei, Shantung, and Honan which amount to 22 mow per farm household. Buck's figures are undoubtedly more reliable but may not be completely representative of the entire region. Buck also finds that 81 per cent of the farmers in these localities own their farms.

The total area of cultivated land, including orchards, reported by the Ministry of Agriculture and Commerce is 317,997,306 mow, which equals 82,812 sq. miles. This is 66 per cent of the entire area. The remaining area comprises land which is used for villages, roads, and graves, or which is pasture or unfit for cultivation. Sandy soil and areas of alkali present problems for which there is no immediate solution, but the cultivated area might be somewhat increased by flood control and improved drainage.

If the population were smaller, a slight seasonal reduction in crop yield would not be serious—certainly not fatal. Here, however, man has crowded the land to the absolute limit. Good years yield no more food than needed, so that a small decrease brings real distress. Famine is recurrent, and scarcely a year passes without suffering in some area. When the rainfall is deficient throughout the region, a catastrophe follows. Precarious agriculture is thus one of the most striking characteristics of the North China Plain.

THE LIFE OF THE PEOPLE

Probably 90 per cent of the people of this region live in small villages or in the country and are directly dependent upon agriculture. These village groups, often no larger than a dozen houses, are so numerous that one is scarcely ever out of sight of two or three of them. Some families live in the open country, but even here the houses are usually grouped together. The average family includes four children and probably grandparents and relatives as well. Families of a dozen children are not at all uncommon.

The houses are built either of soft gray bricks poorly burnt with straw or, more frequently, of pounded earth or sun-dried cakes of mud. The roofs are often of mud laid upon kaoliang stalks, which in turn rest upon the wooden rafters that lie on the main beams. Because of the considerable weight which these beams support, they must be eight inches or a foot in diameter. Upright wooden supports are used to hold up the roof, so that it is independent of the earthen walls which might soften and collapse after a rain. The construction of Chinese houses thus resembles that of modern steel skyscrapers in that the visible walls bear none of the weight. House construction calls for a few heavy beams and numerous small branches for the rafters. Timber of these two dimensions is obtained by pollarding willow trees, that is, cutting back to the trunk to encourage the growth of small uniform branches.

The wooden roof beams are the most expensive part of a house, and when a house is abandoned the wood is taken along. They likewise represent an investment which may be sold under the pressure of famine. The only other articles of wood are the removable double doors and the paper-covered lattice window frames. There is usually but little furniture; and a low brick bed, or kang, and a stove form the chief equipment. These kang are hollow and connect with the mud cook stove so that the smoke circulates through them and provides a warm platform during the winter.

The mud roofs crack during the hot, dry summer and the first rain trickles through in numberless rivulets. The traveler need not be disturbed, for after the roof has become thoroughly soaked, he will hear some one pounding around on the roof tamping or rolling down the mud, which thereafter remains water-tight.

Houses commonly face south, in order to take advantage of the warmth of the sun and to avoid the bitterly cold blasts of the winter which come from the northwest. Each house is surrounded by a courtyard with mud walls, at the sides of which are shelters for the

farm animals and implements. There are no outside windows and but one gateway.

Standards of living are low. During the winter months, when there is little work in the fields, the diet is frequently just enough to keep life going, only two scant meals a day. During harvest time, when there is much to be done, three relatively good meals are eaten. The meals are much the same day after day and consist of boiled millet

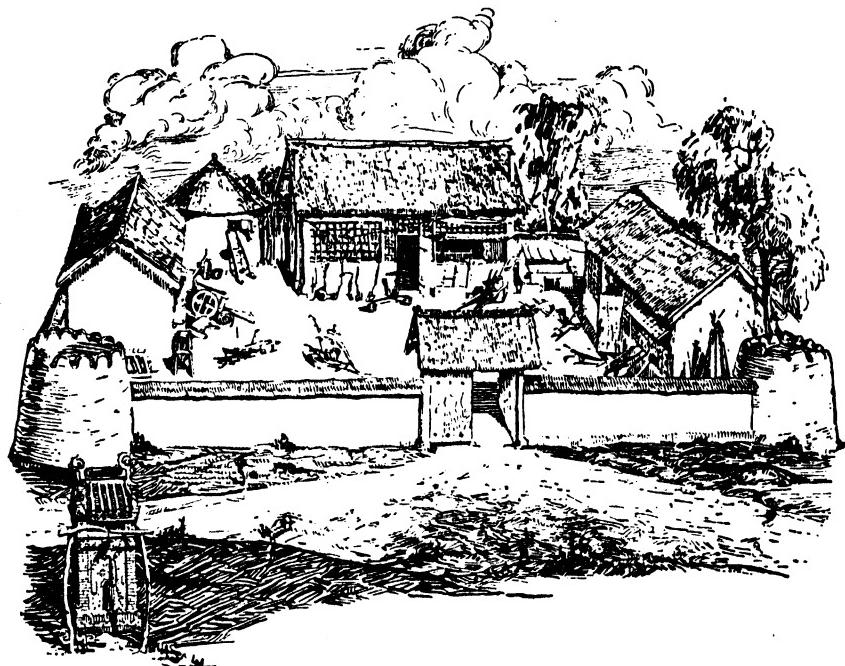


FIG. 79.—Typical farm courtyard of North China, with mud walls and thatch roof.
(*Chinese Eastern Railway.*)

or kaoliang with a few vegetables, steamed bread or noodles made of wheat, and bean curd. Meat is a rare treat, in most cases being restricted to festival days or wedding feasts, except among the more wealthy families. Rice is also a luxury. Most of the food is raised on the farm, and purchases are usually limited to tea, salt, and cooking oil.

Despite these limited resources, the people lead a life which appears relatively happy. Their resources are few, but so are their wants. If the harvest has been good, they may visit a near-by market town and spend a few days visiting relatives or seeing the temple fair. Since it is seldom possible to cultivate the fields during the winter

months, the farmers have much leisure time. At such seasons gossip becomes the chief occupation, and many hours are passed in telling and retelling some strange or curious event, or in discussing that most popular of subjects, the price of food.

CITIES OF THE PLAIN

The North China Plain is characterized by scattered settlement rather than urban concentrations. Several important cities are present, but they include only a small fraction of the total population. Table XXI lists the chief cities with estimates of their size. In most cases there is no way of determining which figure is most reliable, but where there is a preference bold-face type is used. The most extensive estimates are those of the resident missionaries published in "The Christian Occupation of China." Other figures are available from Arnold's "China, a Commercial and Industrial Handbook," the Maritime Customs, Father Richard's "Comprehensive Geography of the Chinese Empire," the Yearbook of the Shun Pao, a Shanghai newspaper, and scattered sources, some of which represent actual census enumerations. In this table and in those for subsequent regions, all cities over one hundred thousand for which figures are available are included together with smaller cities of special importance. Alternate names are given in parentheses.

TABLE XXI.—CITIES OF THE NORTH CHINA PLAIN

City and province	"Christian Occupation of China" (1922)	Arnold, "Commercial Handbook" (1926)	Other estimates with source
Peiping (Peking), Hopei.....	850,000	1,181,400	1,467,537 (Census, 1932)
Tientsin, Hopei.....	900,000	838,629	1,387,462 (Customs, 1931) 1,322,175 (Census, 1932)
Tsinan (Licheng), Shantung....	300,000	283,000	100,000 (Richard, 1908)
Kaifeng, Honan.....	280,000	.....	145,769 (Census, 1928)
Suchow (Tungshan), Kiangsu	125,000	.....	125,000 (Shun Pao Yearbook)
Weihsien, Shantung.....	100,000	97,000	100,000 (Shun Pao Yearbook)
Paoting (Tsingyuan), Hopei....	100,000	.....	80,000 (Richard, 1908)
Tangshan, Hopei.....	85,000	.....	100,000 (Shun Pao Yearbook)
Shanhaikwan (Linyu), Hopei..	70,000	.....	90,000 (Richard, 1908)
Chengchow (Chenghsien), Honan.....	35,000	.....
Haichow (Tunghai), Kiangsu	30,000	
Chinwangtao, Hopei.....	5,000	20,020 (Customs, 1931)

CITIES OF THE PLAIN

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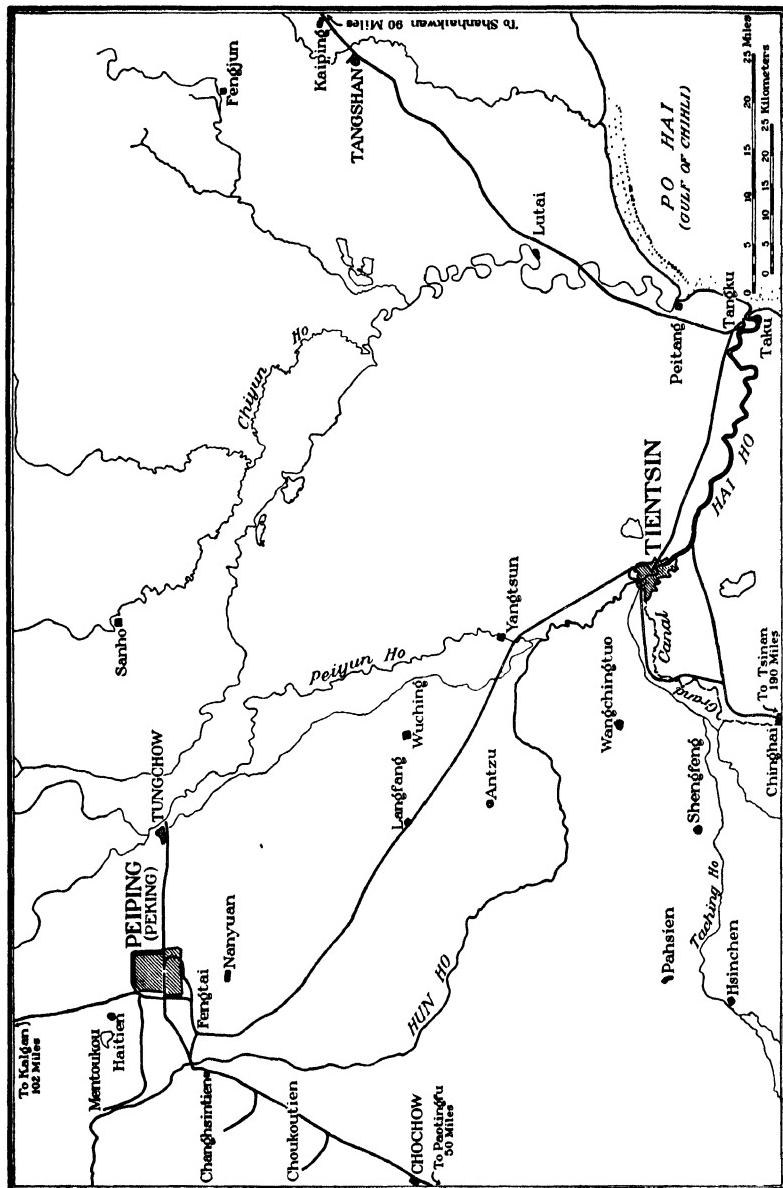


Fig. 80.—Peiping and Tientsin are the leading cities of the North China Plain. The innumerable market villages would fill this map to overflowing. Choukoutien, in the west, is where *Sinanthropus* was found.

Market villages with a few hundred houses, a dozen shops, and a temple or two dot the landscape in all directions. These hamlets are the economic centers of the Plain, and many farmers never journey beyond the circle of villages visible from their housetops.

The most interesting city of the region is Peking, now known by one of its ancient names—Peiping. The city owes its importance largely to political rather than to geographical factors. It lies in the midst of an agricultural plain with a position similar to that of scores of unimportant villages. Its chief locational significance is in its nearness to Nankow Pass, the principal gateway to Mongolia.

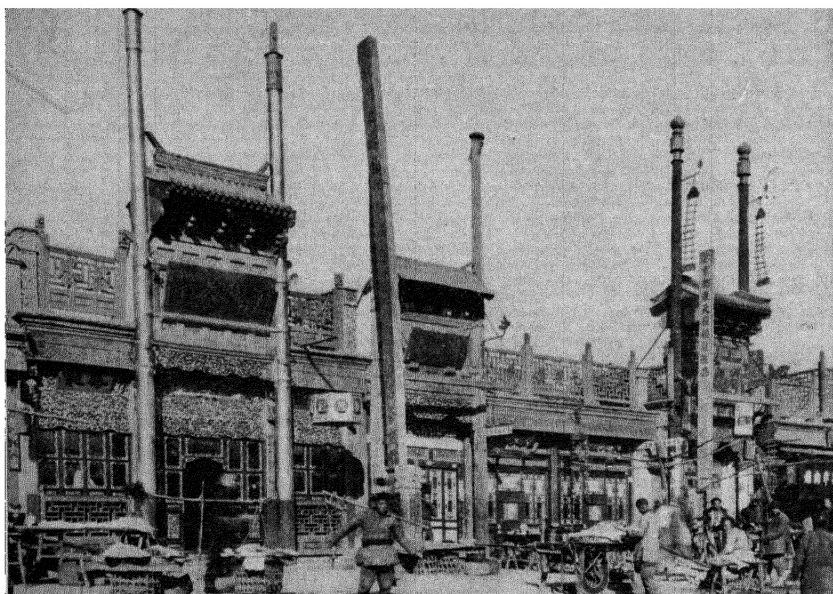


FIG. 81.—Many shop fronts in Peiping are intricately carved and beautifully lacquered. Peddlers with their wares slung from carrying poles or on wheelbarrows offer tidbits to the hungry passer-by. (*Publishers Photo Service.*)

Peiping is really five cities in one. Within the great Tartar city with its magnificent 50-ft. walls are the Forbidden City of the Emperor, the Imperial City of his servants and retinue, and the Legation quarter, each with its own walls. Adjoining the Tartar city on the south is the Chinese city, also walled. Seen from the towers which surmount the city gates, Peiping presents a picture of distinctive charm. Native residences, surrounded by trees, are one story, but rising above them are the yellow, green, and purple tiled roofs of palaces and temples. Broad straight avenues connect the principal gates, with narrow residential streets forming a network of winding lanes. Passing along these streets one sees nothing of the life which goes on within the walled courtyards. Stores, on the other hand, are open to the street.

When Eugene Chen was Minister of Foreign Affairs in Hankow during the Revolution of 1927, he boasted that six months after the Nationalists captured Peiping it would be a deserted and forgotten country village. That prophecy has not been realized, but the removal of the capital caused the closing of thousands of shops and brought acute distress. Peiping is fortunately a railroad focus of considerable importance, but these lines contribute equally to the port of Tientsin. The former capital has long been the cultural and educational center of China. Its art collections and magnificent palaces are unsurpassed and will continue to make Peiping the joy of travelers from all parts of the world. In the absence of political and commercial advantages, Peiping must depend largely upon its cultural attractions.

In contrast to the ancient city of Peiping, Tientsin is a modern commercial and industrial seaport. It is located on the Hai, or Pei Ho, 40 miles from the sea and is the leading port of the North China Plain. Its harbor is far from satisfactory; the river is narrow and winding and frequently becomes filled with mud. Millions of yuan have been spent for dredging, but in the course of a single season the river may become so silted that even the smallest ships cannot enter. To add to its difficulties, the river freezes in the winter and is kept open only by ice breakers. On account of Taku Bar across the mouth of the river, larger vessels are forced to anchor several miles out at sea and discharge their passengers and freight into lighters. Despite these disadvantages, Tientsin has experienced a phenomenal growth and has a large future. Its hinterland consists not only of the northern half of this geographic region but also of the provinces of the northwest, much of Mongolia, and even distant Sinkiang.

The only natural harbor in Hopei is at Chinwangtao. Its position, however, is a handicap, for it lies at the extreme corner of the Plain and involves too long a rail haul. It has been developed chiefly to care for the shipments of coal from the near-by Kailan mines.

The southern half of the North China Plain does not as yet have an important harbor; but with the development of harbor facilities near Haichow at the end of the Lung-Hai Railway, it is probable that this port will greatly increase in importance.

The North China Plain thus has three seaports: Tientsin, which will probably always remain the most important, Chinwangtao, and Haichow. None of these is in any respect first class. The best available harbor is at Tsingtao, located just outside the Plain in the mountains of Shantung, but with easy access by railroad. Tsingtao has the advantage of superior harbor facilities, but it has the disadvantage of being

farther from the hinterland and therefore requiring a longer and more expensive rail haul.

The construction of railroads has increased the importance of a number of cities, especially those located at the intersection of two lines. On the Tientsin-Pukow Railway this growth is illustrated by Tsinan, which is the junction for the railroad to Tsingtao, and Suchow, where this line meets the Lung-Hai Railway.

Along the Peiping-Hankow Railway there are two other cities occupying similar positions, although as yet they are of much less significance. These are Shihchiachwang, where a narrow-gage railroad leads westward into the Shansi Mountains, and Chengchow, where the Lung-Hai Railway crosses the Peiping-Hankow Railway.

The North China Plain contains a large number of small cities and market towns, each one very much like all the rest, and having no particular geographic reasons for their location except the normal trade of the surrounding plain. A few of them, such as Kaifeng and Paoting stand out because of their political significance; but the rest are of importance only to those who live in their immediate vicinity.

TRANSPORTATION FACILITIES

Transportation is made relatively easy by the level character of the plain. There are neither hills nor valleys, and highways connect the various villages in response to the requirements of local trade. Roads are often merely the unguided accidents of travel, for they are seldom planned according to any definite system. Secondary roads are rarely on public land, and farmers sometimes do their best to make the section which crosses their property so undesirable that traffic will be forced to strike a path across a neighbor's field, even though it be plowed or ready for harvest. In contrast to these local roads, a system of ancient and much traveled highways connects the principal cities of the region, focusing on Peiping.

In winter and spring these cartways are thick with dust, great clouds of which are raised by the passage of each cart or animal. In summer the roads, which often are slightly below the level of the surrounding fields, are deep in mud and are often impassable for days. Travel is rarely undertaken for pleasure. Since they have failed to construct lasting roads, it has well been pointed out that the Chinese have built indestructible carts. These springless two-wheeled vehicles, with narrow iron-studded tires which cut through mud and dust to the firmer ground beneath, are well adapted to the requirements of travel but are scarcely comfortable.

Passenger carts are small and pulled by one animal. The transport of freight is chiefly by larger two-wheeled carts, pulled by from two to as many as six or seven mules or donkeys. The hire of these carts averages one yuan a day for each animal. If the roads are neither too muddy nor too dusty, or if too much time is not wasted ferrying across the shallow rivers or in the noon-day siesta, they may travel as much as 25 miles a day. The amount which these carts can carry varies according to their size and the condition of the roads, but even under the most favorable circumstances the amount seldom exceeds a ton, so that the cost of transportation soon becomes prohibitively high.

Pack animals are also employed, and wheelbarrows enter into the competition. This region is preeminently the home of the wheelbarrow, on which amazingly bulky burdens may be transported. Both goods and passengers are carried, and small boys frequently assist their fathers by pulling with a rope in front of the squeaking barrow. When the wind is favorable, sails are sometimes fitted.

It is difficult to make comparisons of the relative costs of transportation by the different methods, as so many factors enter into consideration, but the following table suggests a fair average.

TABLE XXII.—TRANSPORTATION IN THE NORTH CHINA PLAIN

Type of transport	Average load	Average mileage per day	Average cost per ton mile
Railways.....	.....	.....	Yuan 0.015
Junks.....	40 to 100 tons	25-35	0.036
Carts.....	1 ton	25-30	0.12
Pack mules.....	250 to 300 lb.	25	0.298
Wheelbarrows.....	700 lb.	20	0.151
Coolie carriers.....	180 lb.	20	0.313

Data from JULEAN ARNOLD, "China, a Commercial and Industrial Handbook," 533.

The North China Plain has many wandering rivers, but they are shallow and silt laden. Steamboat or launch traffic is rarely possible, and only small river junks can be used. The only artificial waterway of importance is the Grand Canal, built to bring the tribute rice from the Yangtze Valley to the court in Peking. This famous highway is now silted up in a number of places or is dry during the winter season when the rains fail. In the vicinity of Tientsin the canal is considerably used; but here it has become an artificial river, receiving numerous tributaries which drain a large area to the west.

Within recent years many unpaved automobile roads have been built. The Plain is without resources of gravel, so that the roads are badly washed during the rains. Fortunately, both mud and labor are cheap and they may easily be repaired. Where small streams are to be crossed, the old stone bridges built for the cart roads have often been utilized, and in many cases these native roads themselves are available, after a fashion, for automobiles.

For many years this region led all China with regard to railroads, but first place has now been taken by the Manchurian Plain. The Peiping-Hankow and the Tientsin-Pukow Railways are the two chief north and south lines and are connected by the Lung-Hai and the Peiping-Liaoning Railways. All these roads carry an enormous traffic in agricultural materials. Under normal conditions they are among the most profitable railroads in the world and indicate the great potentialities of this region.

A LAND OF FAMINE

The curse of the North China Plain has been famine. Few years out of the last two thousand have passed without distress in some district, and many times it has been widespread and acute. Why should this be? With all its disadvantages, this region is still greatly favored by nature and should be the home of a prosperous and happy people. Instead of certainty and plenty, the gaunt specter of famine hovers over the land.

Too often the cause of famine has been political. During the fighting of recent years, army after army has swept across the region and stripped the countryside of supplies of food, carts, and animals. With such a situation, no climatic misfortune is necessary to bring starvation. In other cases, famines have been due to social and economic causes and may thus be prevented or lightened by better credit systems, improved transportation, and the like.

By far the largest number of famines have resulted from either too little water, as in droughts, or too much, as in floods. This is an area of great uncertainty in the rainfall. Long dry periods are sometimes broken by torrential rains. The encircling hills have been denuded of their original forest cover and so do not hold back the run off. Man can probably do nothing to regulate rainfall, but it may be possible to control rivers and so prevent devastating floods. Furthermore, irrigation and drainage can do something to increase the area of cultivated land and so insure a more regular supply of food. During the famine of 1921, geological studies by George B. Barbour of Yenching University revealed the possibility of deep wells in several

small areas south of Peiping, and the digging of these wells has insured these districts from future famines in so far as a shortage of water is concerned.

It is not fair, however, to place the entire blame for famine upon nature. Man himself must assume a large responsibility. Despite climatic uncertainty, unfavorable years need not bring starvation if a surplus has been accumulated in earlier years of plenty. At present this is impossible, for the land is so crowded that no opportunity



FIG. 82.—When the dikes break, the rivers spread over vast areas of farm land. Centuries of experience with floods have taught the farmers near Tientsin to build their homes on artificial mounds. (*China International Famine Relief Commission.*)

of saving exists. Good harvests yield only enough for the teeming multitudes who crowd the plain, and a year of subnormal crops finds them with no accumulated stores. Everything must then be sacrificed to buy food: farm animals, implements, land, clothes, and perchance even children—all must go. Without resources the people must migrate, receive help from the outside, or starve.

The elementary fact is simply this—the North China Plain appears to have too many people for safe and profitable existence. What would mean prosperity for a smaller population can mean only precarious living for 80 million. Better transportation, agricultural education, and river control may all make considerable contributions to their welfare but probably cannot do enough. With the present

density of population and but little possible expansion in cultivable land, no increase in prosperity sufficient adequately to raise the standard of living seems possible. The fundamental reason for famine in

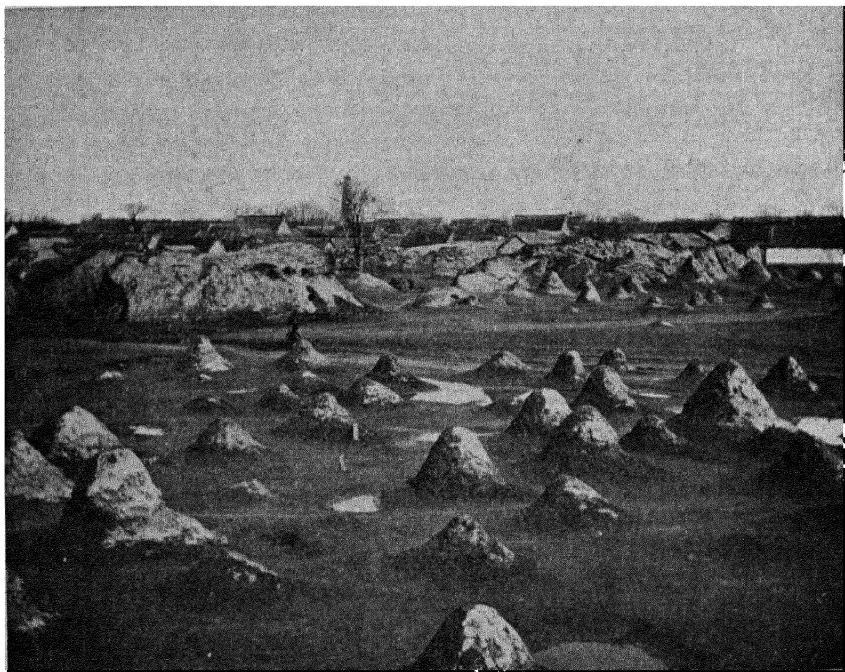


FIG. 83.—The ever-present grave mounds constantly remind the farmer of the family heritage. (*F. N. Meyer, courtesy U.S. Bureau of Plant Industry.*)

this region is overpopulation: there are plainly too many people for the land to support in safety. This is the fact of all facts for the North China Plain.

NOTE. Additional views of the North China Plain will be found in Figs. 1, 7, 16, 25, 32, 41, 43, 54, 59 and 68.

CHAPTER VIII

THE LOESS HIGHLANDS

THE TOPOGRAPHIC SETTING

The Loess Highlands form a unique region of loess-clad hills and barren mountains between the North China Plain and the deserts of Central Asia. Most of the area is thoroughly dissected so that human activities labor under the restriction of unfavorable land forms. Rainfall is so low that the only safe cultivation is in the valleys, and the hillsides are often bare or covered merely with short grass which withers after the summer rains. Most striking of the characteristics is the widespread occurrence of fine wind-blown loessial silt, more extensively developed here than anywhere else on Earth.

Within this geographic region are three types of topography: low-lying alluvial plains, rugged mountains, and loess plateaus cut into a maze of ravines. The chief areas of level land are the Tatung plain in northern Shansi, the valley of the Fen Ho south of Taiyuan, the Chiehchow plain in southern Shansi, the Wei Ho Valley around Sian, and the plain south of Nanyang in southwestern Honan. These areas of level land in some ways resemble the North China Plain but are drier and not so flat. In most instances they appear to be down-faulted grabens. Provincial statistics for Shansi show that less than 10 per cent of the land is level, and the average for the rest of the region is probably no higher.

Mountains rim the area on most sides, some of them within the Highlands, as the Taihang Shan in Shansi, with others in adjoining regions. Both in Shansi and Kansu there are peaks which exceed a mile and a half in height. The most notable ranges within the region are the Liupan Shan in Kansu and Wutai Shan in Shansi. In general, the mountains are rounded, although many are characterized by steep slopes and narrow valleys. The total area occupied by mountains does not exceed a quarter of the region. Average elevations throughout the Highlands approach a mile, being higher in the west. The larger plains in Shansi and Honan are but a thousand feet above sea level, while almost the entire province of Kansu is above 4,500 feet.

The largest part of the region is blanketed in a sea of yellow loess, beneath which is submerged the ancient topography and through

which project the higher mountains. Exposures of bedrock are thus limited to these mountains and to small outcrops in those valley bottoms where streams have cut through the loess to the underlying rock formations.

The Loess Highlands include all of the province of Shansi, large portions of Shensi, Kansu, and Honan, together with smaller parts of Ningsia, Suiyuan, Chahar, and Hopei. The western and southern limits are formed by the Tibetan plateau and its offshoot the Tsingling. Near Sian the boundary is sharp; elsewhere it is gradational, following the northern edge of the mountains. The western limit lies a short distance west of Lanchow and Titao. On the north the region faces the Gobi, Ordos, and Alashan Deserts of Inner Mongolia. The boundary approximately coincides with the position of the Great Wall except in Suiyuan and Chahar, where it includes the region outside the Wall known as *kou wei*. Topography, loess distribution, and land utilization combine to mark the northern limits of the area. Each of the following cities lies within the region and not far from the northern border: Kalgan, or Changchiakow, Pingtichuan, Kweihwa—Suiyuan, Yulin, Ningsia, Chungwei, and Lanchow. The best defined boundary is that to the east where the mountains give way abruptly to the North China Plain.

The area of the region is 202,516 sq. miles (524,654 sq. km.).

THE LOESS

Sprinkled over the countryside as though by a giant flour sifter, a veneer of fine wind-blown silt blankets over a hundred thousand square miles of the northwestern provinces.¹ Although this formation is described by the German word *löss*, derived from deposits along the Rhine, it would not be unappropriate for these far more extensive

¹ The following references deal with loess:

BARBOUR, GEORGE B.: The Loess of China, *China Journal of Science and Arts*, III (1925), 454–463, 509–519; also *Annual Report Smithsonian Institution* (1926), 279–296.

———: The Loess Problem of China, *Geological Magazine*, LXVII (1930), 458–475.

CRESSEY, GEORGE B.: The Distribution and Source of Chinese Loess, *Bulletin Geological Society of America*, XLIII (1932), 131.

KANTER, H.: Der Löss in China, *Mitteilungen der geographische Gesellschaft in Hamburg*, XXXIV (1922), 99–150.

OBRUCHEFF, V. A.: Das Lössland des Nordwesterns Chinas, *Geographische Zeitschrift*, I (1895), 263.

SCHMITTHENNER, H.: Die chinesische Lösslandschaft, *Geographische Zeitschrift*, XXV (1919), 308–332.

VON RICHTOFEN, FERDINAND: On the Mode of Origin of the Loess, *Geological Magazine*, N.S. IX (1882), 293–305.

accumulations to be known by their Chinese name of *hwang tu*, or yellow earth. The material consists of a very fine silt, yellowish brown in color, so fine that when rubbed between the fingers it disappears into the pores of the skin without noticeable gritty material. The porosity exceeds 45 per cent, enabling loess to hold considerable moisture, while the fineness of the openings facilitates capillary action.

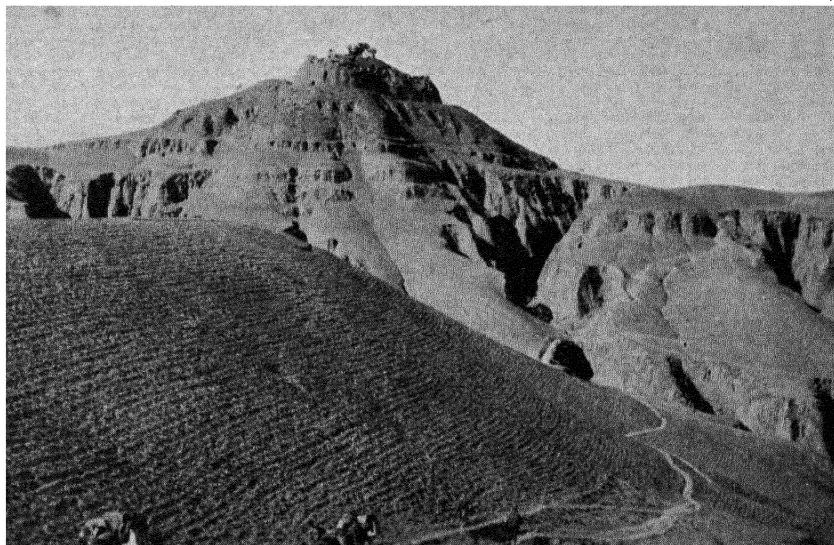


FIG. 84.—The bare slopes of loess are an easy prey to erosion and are trenched by steep-sided ravines. Owing to the ever-recurring danger of bandits, many hilltops are fortified and whole villages retire to these places of refuge in times of peril. (*China International Famine Relief Commission.*)

The thickness of the true wind-laid loess varies according to a number of factors, including the relief of the original terrain upon which it accumulated. Beneath the loess are clays and sands of different origin but somewhat similar properties, and it is the failure to distinguish these earlier beds which has led to exaggerated estimates of the thickness of the loess, sometimes running to a thousand feet and more. The writer has traveled hundreds of miles across the heart of the loess country and has seen no measurable exposures which exceed 100 meters (330 ft.). No thicker deposits have been reliably reported, although they may exist in northern Shensi.

The distribution of Chinese loess is shown, here for the first time, in Fig. 85. Although deposits are present throughout the Highlands, the region south of the Ordos Desert is the loess land *par excellence* of the world. The loess reaches its greatest development in northern

THE LOESS HIGHLANDS

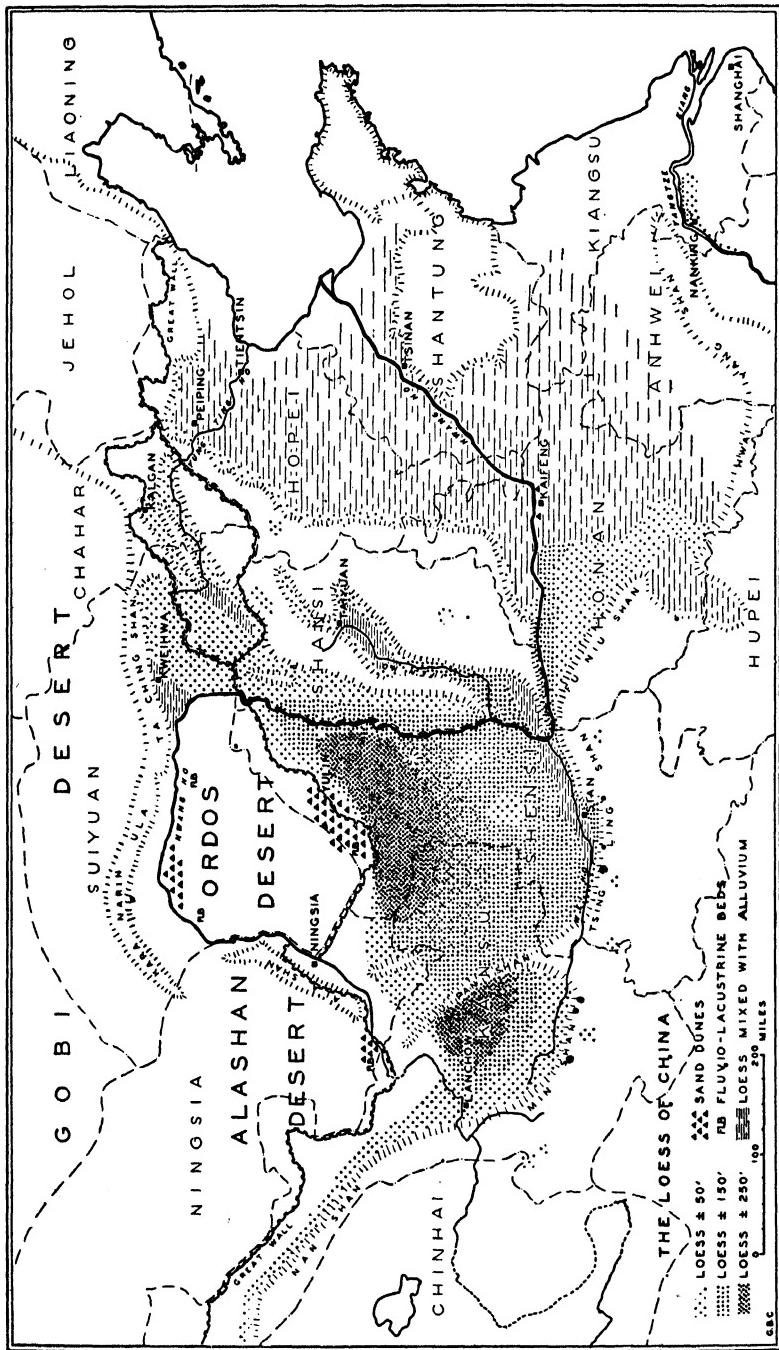


FIG. 85.—The wind-laid loess of northwestern China covers an area of 119,090 sq. miles, and the volume is estimated at 2,852 cu. miles. This does not include the alluvial plains which are built in part of loess.

Shensi and central Kansu, divided by the high Liupan Shan. No similar accumulations are present where the Gobi itself abuts on the Great Wall, and it seems likely that the marked concentration south of the Ordos is related to unique conditions of origin in that area. The high Tsingling Mountains abruptly mark the southern limits of the loess. Isolated areas are found along the Yangtze near Nanking, probably derived from the flood plain of the river, and in Szechwan and southern Shensi where it is possible that they may be related to glacial rock flour.

The total loess-covered area as shown on the map, not counting the plains where it is mixed with alluvium, amounts to 119,090 sq. miles. The volume is estimated at 2,852 cu. miles.

The wind-laid origin of China's loess deposits has been recognized since the days of von Richthofen and Pumelly. Similar deposits in Europe and North America are associated with glaciation, but there were no Pleistocene continental glaciers in Asia. Pumelly has suggested that the material was derived from a widespread soil cover in Mongolia, developed under some more moist climate and removed with increasing aridity and wind work. The Gobi is now quite free from fine silts, and the widespread dust storms of North China are probably more local in origin. If Mongolia had been the original source of the material, it would seem natural that the accumulation should be more or less uniformly distributed around its margin. The marked concentration south of the Ordos, on the other hand, suggests an important secondary source of supply.

The recent physiographic history of the Ordos is tied up with the complex development of the Hwang Ho. While final field evidence is lacking, it appears probable that the river has recently deposited a considerable part of its muddy load in this area either in a vast lake or in subaerial fluviatile beds. In contrast to the rock-floored Gobi, the Ordos is covered with poorly consolidated sands and clays, which supply ideal material for wind attack. Under the northwest winds, the coarser sands are rolled along the surface and heaped into sand dunes. The finer silts are lifted into the air and hurdle the dunes, so that they come to rest in the grass lands south of the Great Wall. Here subsequent erosion has developed the unique topography of the loess country. Figure 85 illustrates the areal relationship of the fluviacustrine beds, the sand dune belts, and the loess.

One of the most striking features of the loess is the way in which it stands in nearly vertical walls, often several tens of feet in height. This property is due to a characteristic vertical cleavage and to the development of a surface cement which binds the otherwise loose

grains. Loess contains a variety of soluble substances. As ground water comes to the surface, it evaporates and leaves behind its chemical load which forms a binder around the fine grains. It is this process which hardens the surface and permits almost vertical cliffs to stand for years. Artificially cut surfaces, as, for example, those along modern motor roads where the evaporation cements have not had time to develop a crust, are more easily eroded by rain wash and do not have the property of remaining vertical as do natural surfaces of slower development. In so far as these unique qualities are the product of evaporation, they are not limited to the loess.

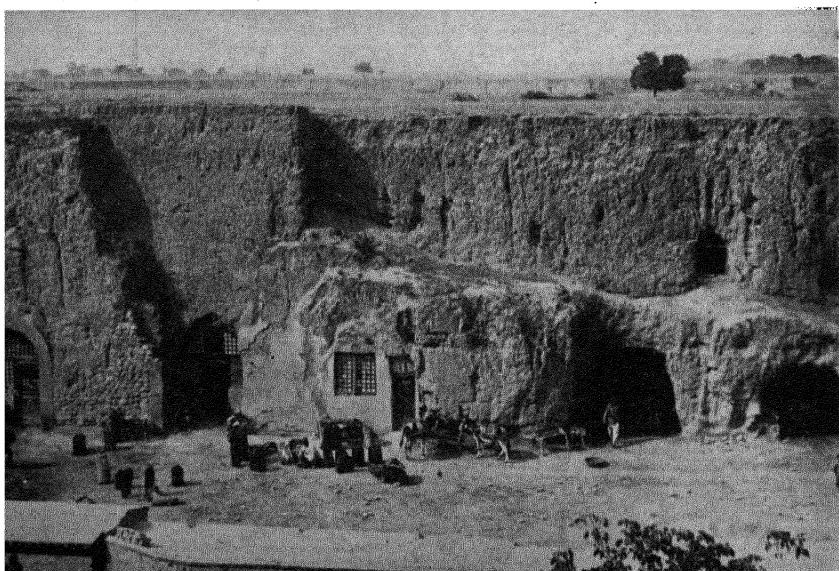


FIG. 86.—Millions of people in the northwest live in dwellings carved in the loess, warm in winter and cool in summer. It is the collapse of these caves which has caused such heavy loss of life during earthquakes. (*Ato Photographic Association.*)

Many loess regions are almost impassable if one does not keep to the established roads. These roads form one of the distinctive features of the country. Each passing cart or pack animal stirs up the loess, which is so light that it easily rises in clouds. As a result of this continual removal of material plus the wash of rains, some of the roads or trails come to be veritable canyons, of a width just sufficient to permit the passage of one vehicle, and with almost perpendicular walls which rise overhead for as much as forty feet or more. Confined within such walls, the traveler may journey for miles with scarcely a glimpse of the surrounding countryside. When two carts meet, one

of them must back up, and much time is wasted in the inevitable dispute as to which it shall be.

The loess is soft and easily cut so that excavations are readily made. The people have taken advantage of this fact, and great numbers have carved their homes in loess banks. Cave dwellings are found everywhere. Such vaults are cool in summer and warm in winter, and owing to the shortage of wood for ordinary construction they form the typical home of those dwelling outside the level plains. Doors and window frames are fitted to the entrance, and passages within may lead to adjoining rooms.

These houses are dug into the sides of vertical cliffs, above which often are cultivated fields. In some cases, chimneys have been cut from the caves to the fields above, so that one sees the curious phenomenon of smoke issuing at numerous points in the midst of a field of grain. No habitation is in sight; but if one peers over the near-by cliff, he will look down into a series of courtyards into which open the dwellings of the farmers whose fields the visitor is standing in. The land thus does double duty, with houses below and fields "upstairs."

The peculiar properties of the loess have a significant bearing on the agricultural importance of the region. Loess provides an unleached soil of exceptional fertility, on which crops may be raised year after year without fertilization. The resorting process of the wind continually renews the loess much as the floods of the Nile contribute to the famed fertility of Egypt. In addition, the ability to hold moisture makes possible the raising of crops despite the limited rainfall. If the Loess Highlands had a more favorable climate and were less dissected, they might be one of the finest agricultural lands in the world.

A CONTINENTAL CLIMATE

The climate of the Loess Highlands is a by-product of the nearness to the desert. Because of the distance from the sea, the summer monsoons have lost a considerable part of their rain-making capacity before reaching the northwestern provinces, and the outblowing winds of winter carry no moisture. There is also the modifying factor of altitude, especially in the west.

The rainfall on the plains is normally about 380 mm. (15 in.). Coupled with this inadequate precipitation are the low humidity and excessive evaporation, which considerably reduce the agricultural value of the already scant rainfall. Normal agriculture is impossible in many sections, and during many years crops cannot be raised without either irrigation or special methods of cultivation whereby the soil moisture is conserved. In years of exceptional rainfall, hillside

crops may mature, but drought is so common that little attempt is made to cultivate the drier sections. The larger plains of the eastern Highlands have sufficient moisture for a fair harvest, but in northern Shensi and in Kansu the rainfall is so low that hillsides remain parched and brown even in midsummer.

Approximately half the entire precipitation falls in July and August, with a little in June. The winters are dry, with occasional light falls of snow. This snow plays an important rôle, for it moistens the fields and makes spring planting possible.

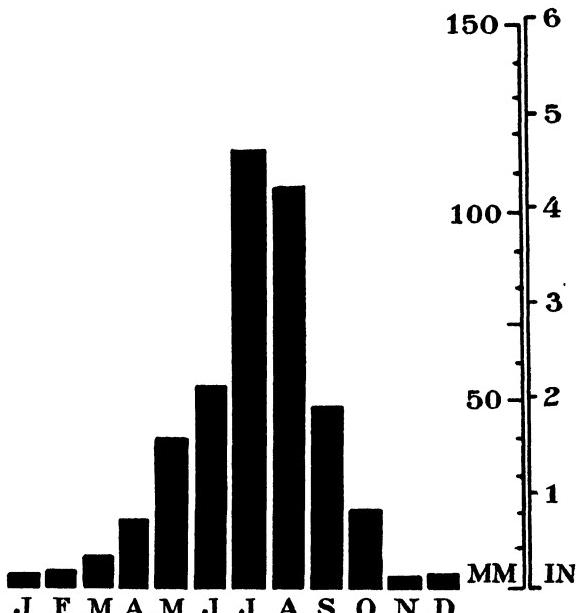


FIG. 87.—Climatic conditions in the Loess Highlands. Rainfall averages derived from Changkiakow (386 mm.), Kweihwa (385 mm.), Luan (498 mm.), Tatung (371 mm.), and Tungyuanfang, near Sian (461 mm.). Temperatures not available.

The summer temperatures seldom rise above 32°C. (90°F.) except in the plains. In Kansu, and in the mountains over five thousand feet, the maximum is seldom above 27°C. (80°F.). During the winter the Highlands are chilled by icy blasts from Mongolia, and the thermometer falls considerably below freezing.

DRY AGRICULTURE

Agriculture in the Loess Highlands is directed by soil and climate. This region shares with the North China Plain an uncertainty and irregularity of rainfall which all too often brings crop failure with its

consequent famine. Since, however, the normal quantity of the rainfall is smaller, there has not been the same inducement to intensive cultivation in this region, and the land is not so densely crowded. Loess furnishes a fertile soil of exceptional characteristics. Wherever present, there is the possibility of cultivation if only the rainfall is adequate. The loess partially makes up for the irregularity of rainfall by its ability to retain moisture for long periods. The water table is often well below the surface, but the porosity of the loess permits the water to rise by capillary attraction near enough to the surface for deep-rooted plants.

The most-favored agricultural sections are the plains in the east where conditions resemble those beyond the mountains on the North China Plain. Elsewhere, cultivation depends either upon irrigation or upon the water-retaining qualities of the loess. The streams on which the irrigated fields depend are usually small and intermittent. Since water sinks into the loess so easily, many of the streams appear at the surface only where the valleys have been cut through to the underlying bedrock. The valley bottoms are usually narrow, and the strips of irrigated land vary from a few hundred yards in width down to narrow shelves of sediment left by the stream during some former flood and likely to be washed away before a crop may be harvested. No attempt is made to irrigate the hillsides or uplands.

In the vicinity of Chungwei and Ningsia in the new province of Ningsia, the water of the Hwang Ho is led into canals which resemble small rivers, and large areas have been transformed from semidesert to green oases. The canals around Ningsia are two thousand years old and represent engineering feats of considerable skill. Two important irrigation projects were completed in 1932 by the China International Famine Relief Commission, one at Saratsi in Suiyuan, where water from the Hwang is distributed to two million mow, and the other in the Wei-Pei district 40 miles northwest of Sian which utilizes the Ching Ha. These irrigated fields along the Hwang Ho and the similar, though much smaller, tracts in other sections, represent not more than 2 or 3 per cent of the entire area.

The major part of the agricultural production is raised on the unirrigated loess fields. Where these are in the plains, cultivation is easy, for the soil is light and easy to till. Much of the loess country, however, is hilly, often with slopes too steep for cultivation. In many districts, the steeper hillsides have been cut down to form sloping terraces, so that plowing is practical. Even with this rude terracing, some fields are unbelievably steep. In one case, the writer has measured a field where the slope was 38° , along which a farmer was precari-

ously guiding a plow. At each step it seemed as if the ox would slip and fall into the valley below. Clods of earth were rolling down the slope, and the field was badly washed by the rain.

The principal food crops are wheat, millet, and kaoliang. All these are adapted to dry conditions, and generations of practical experience have led the farmers to select the most drought-resisting varieties. The lateness of the rains is a special problem, for they may not fall until July, after which there is scarcely time for crops to ripen before winter sets in. Wheat sometimes grows no more than a foot or two high.

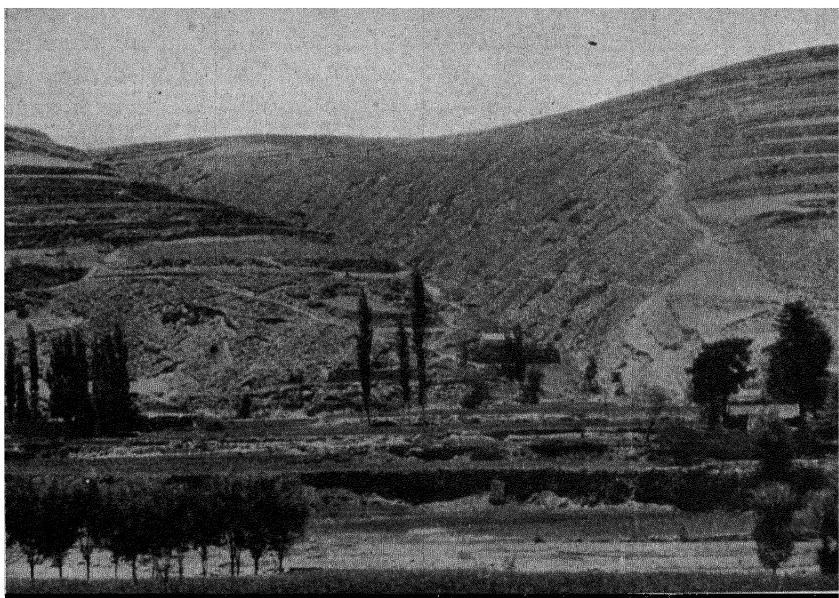


FIG. 88.—Green valley bottoms and barren loess hills, with irrigated opium poppy in the foreground and dry terraces for wheat on the hills. Mid-July in Kansu.

The agricultural statistics for Shansi are among the most reliable in the country. According to these returns, the percentage of crop areas are as follows: millet, 43 per cent; kaoliang, 16 per cent; and wheat, 14 per cent. The figures for Kansu, Shensi, and Honan are somewhat less accurate but nevertheless indicate the relative importance of the various products. These provinces practically reverse the figures for millet and wheat, with the latter occupying from 45 to 60 per cent of the total crop area. Throughout the region, these three staple grains take up three-fourths of the entire cultivated land and so

form the chief food of the people. The wheat is of excellent quality and is made up into baked or steamed breads or eaten in the form of *mien*, or noodles. The other grains are commonly boiled.

In addition to these grains, a variety of vegetables and fruits are produced. These are especially fine in Kansu, where the altitude makes possible the growth of many products raised in the United States and Europe. Apricots, peaches, and melons are the best fruits, while the list of vegetables includes both sweet and Irish potatoes, carrots, onions, cabbages, and string beans. This assortment is hardly typical of the entire region, however, for away from the favored valleys the food of the common people is poor and lacking in variety. There are few places in China where the traveler will find more miserable meals. Day after day the fare consists merely of boiled millet or noodles and cakes of unleavened bread.

The isolation of the western portion of the Loess Highlands makes it difficult for the inhabitants to export staple crops to the more populous part of China. Most products which they might raise are too bulky to pay for shipment by pack animals or carts. In order to have a marketable crop, it is necessary to produce something which combines high value with small weight. Mountaineers the world over face this difficulty and not infrequently violate the laws made by the people of the plains. In the Appalachian Mountains of the United States some of the farmers raise corn and illegally convert it into "moonshine" whiskey which is cheaper to transport and easy to conceal. In Shensi and Kansu opium is the principal product which can be sold at a distance for a profit. No other crop has such high value in easily transported form or is in such demand. In many districts, two-thirds of the irrigated valley bottoms are devoted to raising opium poppy. By thus replacing food crops, opium has contributed to famine conditions. The solution for the problem of opium lies not in merely passing prohibitory laws or in collecting fines, but in recognizing the geographic background of the area and in remedying the situation through the construction of improved transportation facilities and in the discovery of other profitable crops.

In addition to opium, two products other than foods are raised as cash crops, namely, cotton and tobacco. Cotton has been cultivated in China since the twelfth century, previous to which time it came from Turkestan. From Central Asia the cultivation of cotton gradually spread into China by way of Kansu and Shensi. At present, cotton is extensively grown in the valley of the Wei Ho near Sian but is nearly all consumed locally. Other important areas are in Shansi and Honan. The tensile strength is good, but the staple is coarse and short.

Kansu is famous for its water-pipe tobacco which is raised near Lanchow, and also farther west around Kanchow. This tobacco is prepared in Lanchow and hauled by cart to the end of the Lung-Hai Railway and from there distributed to all parts of China. This particular tobacco is so highly prized that it is even exported to the Chinese of Singapore.

When Marco Polo traveled through Shansi nearly seven centuries ago, he made repeated mention of the flourishing silk industry and named many districts where it was produced. This industry has almost disappeared today and is continued only in a few centers. The Loess Highlands are too cold and dry for mulberry, so that the silkworms are fed on oak leaves.

The total area of cultivated land amounts to 135,833,402 mow (22,638,900 acres). This represents 17 per cent of the entire region. The area of cultivated land per person amounts to 3.1 mow, and there is a density of 1,242 people per square mile of cultivated land.

RACIAL DIVERSITY

The Loess Highlands have a most interesting historical background. The valley of the Wei Ho around Sian is known as the cradle of Chinese civilization, and much of the early history of the country was enacted here. Farther west, in the vicinity of Lanchow and Titao, still earlier traces of culture have been found. It is sometimes supposed that the Chinese migrated to China from Central Asia by way of the Loess Highlands. Whether this be proved or not, this region has been the gateway through which have come repeated invasions from the north and west. Here was the home of the great Chin Shih Huang-ti, who conquered North China and united the various sections of the Great Wall more than twenty centuries ago. This region was several times attacked by Genghis Khan, and later there were several invasions from Tibet.

This is the only region in China where the five races represented on the old five-striped flag are found. There are Mongolians living in the north and Tibetans in the west, while several cities contain colonies of Manchus who formerly were stationed as garrisons under the Manchu empire. Chinese, of course, constitute the bulk of the population; but in Kansu there are large districts inhabited almost entirely by Mohammedans. These people are not merely Chinese with a different religion. Although they speak the Chinese language and wear practically the same dress, they represent in origin a distinct race. These Mohammedans came to China in the ninth century from Turkestan and Persia and now number about five million in the whole

country. They are scattered in all the provinces, with the largest number, about two million, in Kansu, around the cities of Haicheng, Titao, and Hochow.

There is much enmity between the Mohammedans and the Chinese. In many cities, although not in those mentioned above, no Mohammedan is allowed to live within the walls. Since they represent a large part of the population, the suburbs are frequently more extensive than the city proper.



FIG. 89.—Although the Mohammedans of Kansu live and dress as the Chinese, their features betray the fact that they belong to a distinct racial group.

In 1861 a disastrous rebellion broke out which was not completely suppressed until 1878. Both Kansu and Shensi were fearfully devastated, and the loss of life was estimated to exceed ten million people. Many sections have not yet recovered from its effects. The bitterness still persists, and a smaller rebellion in 1928, complicated with political

situations, is reported to have caused the death of nearly two hundred thousand in Kansu.

The population of the Loess Highlands is still further varied by the presence of numerous aborigines who dwell in more isolated mountains of the west.

According to the Post office estimates of 1926, the total population of the region is 43,923,104, the largest part of whom live in the plains and valley bottoms. This is an average of 211 per square mile (83 per square kilometer). Many of the cities owe their importance to a strategic location with respect to through trade rather than to the demands of their immediate vicinity. The chief cities are as follows:

TABLE XXIII.—CITIES OF THE LOESS HIGHLANDS

City and province	“Christian Occupation of China” (1922)	Arnold “Commercial Handbook” (1926)	Other estimates with source
Sian (-fu), (Changan), Shensi.	250,000	200,000	1,000,000 (Richard, 1908)
Lanchow (Kaolan), Kansu.	110,000	500,000	500,000 (Richard, 1908)
Kweihwacheng (Suiyuan), Sui-yuan.....	.....	65,000	200,000 (Shun Pao Yearbook)
Ningsia, Ningsia.....	85,000		
Kalgan (Changkiakow), Chahar.....	72,000	75,000	51,363 (Local)
Taiyuan (Yangku), Shansi.....	80,000	220,000	230,000 (Richard, 1908)
Sanyuan, Shensi.....	80,000		
Fenchow (Fenyang), Shansi	65,000		
Tatung, Shansi.....	.....	50,000	47,345 (Local)
Pingliang, Kansu.....	55,000		
Nanyang, Honan.....	50,000		
Loyang (Honanfu), Honan.....	30,000		

A LAND OF EARTHQUAKES

The Loess Highlands is one of the most active earthquake zones in southeastern Asia. On Dec. 16, 1920, a violent earthquake shook eastern Kansu, causing one of the greatest disasters of modern times. This shock occurred in the heart of the loess country and caused great areas of hillside loess to slide down into the valley bottoms, where the avalanches buried whole villages. This slipping of the land was so extensive that it has well been said that “the mountains walked.” From one hilltop the writer has counted forty of these great landslides,

each of which were several hundred yards wide and from half a mile to two or three miles long. Since the people of this vicinity live in caves in the loess and the quake occurred at night, the loss of life was exceptionally high. According to records collected by the local magistrates, 78 out of 100 people were killed, and the loss of life reached the appalling figure of 246,000.

Historical records show that several areas in the Loess Highlands have experienced very severe earthquakes, notably in the vicinities of Ningsia and Sian. The greatest catastrophe ever recorded in all human history took place in 1556, when an exceptionally severe earthquake occurred in the valley of the Wei Ho near Sian. At this time 800,000 people in Shensi, Shansi, and Honan are said to have lost their lives.

THE PRINCIPAL HIGHWAYS

The Loess Highlands are characterized by isolation. On account of topography, communications are difficult and the region has but little contact with the outside world. Railways and motor roads tap the eastern portion of the region, but elsewhere travel is by carts or pack animals. Modern methods of transportation will transform the economic life of the region.

The principal cart roads form parts of the old imperial highways, the chief of which led from Peiping to Sinkiang by way of Sian. This famous road enters the Loess Highlands to the west of Chengting in Hopei and leads westward across the mountains to the basin of Taiyuan. Here it turns southward along the valley of the Fen Ho to the Hwang Ho at Tungkwan, the gateway of central Asia, where important roads lead eastward to the ancient capitals of Loyang and Kaifeng and westward to the even more famous capital of Sian, or Changan. Just west of Sian the road divides, one branch leading to Szechwan and the other continuing northwest to Lanchow. The former is only a mule trail, but over the latter there is a continual stream of two-wheeled carts. The other principal highway in the Loess Highlands which is suitable for cart traffic leads from Nankow Pass to Changchiat-kow or Kalgan, and west to Tatung, Kweihwacheng, and Paotowchen (see Fig. 13, page 26).

Throughout most of the region, transportation is by pack animals over narrow trails which wind among the mountains or the loess ravines. Coolie carriers and sedan chairs are rarely employed, and wheelbarrows are never used for long distances.

Within recent years several hundred miles of automobile roads have been constructed, and in the absence of railways these roads

will greatly assist in the development of commerce and the spread of modern ideas. The greatest length is in Shansi, where some of the first roads were built by the American Red Cross and other famine-relief organizations so that grain might be brought to stricken areas.

Regular buses operate the length of Shansi from Tatung to Tung-kwan. There are also branch roads to the east and west of the province. Another automobile road extends from the end of the Lung-Hai Railway to Sian, and it is now possible for cars to reach Lanchow,

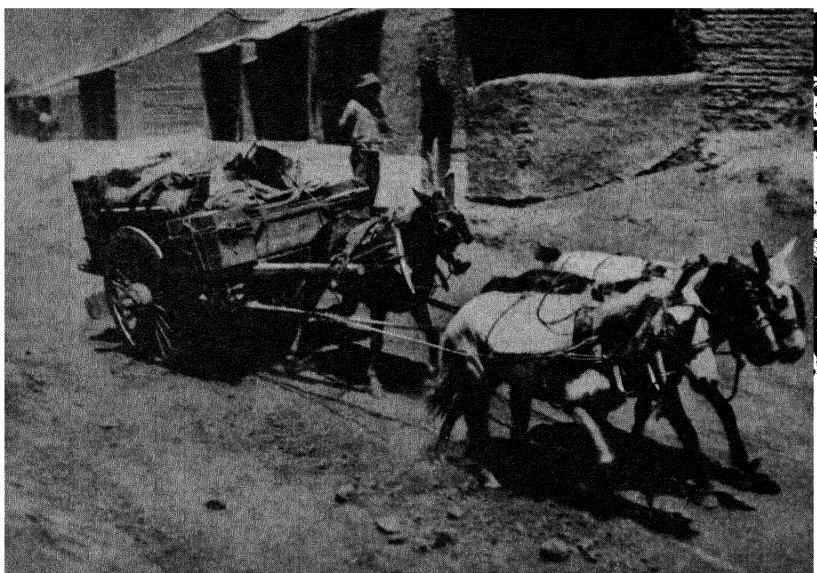


FIG. 90.—Along the great highway of Central Asia, 75 miles east of Lanchow. The carts are carrying water-pipe tobacco from Kanchow en route to the coast.

the capital of Kansu. Lanchow is also connected by a road around the Hwang Ho through Ningsia to the end of the Peiping-Suiyuan Railway at Paotowchen. This road is poorly constructed and is not in commercial use.

Three railroads penetrate the Loess Highlands. One of these is the Peiping-Suiyuan Railway which passes through Kalgan, Tatung, and Kweihwacheng to Paotowchen. The second railroad is the Cheng-Tai line, a narrow-gage railway from Shihchiachwang on the Peiping-Hankow line to Taiyuan in Shansi. In the south the Lung-Hai Railway is pushing westward into the Loess Highlands and should reach Sian during 1934. In the future the Lung-Hai will doubtless be extended as far as Lanchow and eventually may be continued

to Sinkiang and Russian Turkestan, where it will meet other railroads already built and form a new route from China to Europe.

BURIED WEALTH

Northwest China contains the richest natural resources of the entire country. Probably no section in all Asia has similar buried wealth. Iron and other metals are present in some quantity, but it is coal which forms the greatest resource. Shansi is particularly fortunate in this respect, for it contains nearly half the entire estimated reserves of China. It occupies a position in China corresponding to that of Pennsylvania or the Ruhr. The quality is excellent and the ratio of anthracite to bituminous is much higher than in most countries. There is a small production of petroleum in Shensi, but no commercial deposits have been discovered.

The development of these buried treasures will revolutionize the economic life of the area. In place of the poverty which today characterizes so many of the people dwelling above this buried wealth, which is as yet unknown to them, there is the prospect of a vast material development. Poor transportation may retard exploitation, but the time will surely come when this area will assume a vital importance in the industrial life of the Far East.

At present, modern coal mining is largely confined to the eastern margin of the region, where railroads make possible the importation of machinery and the export of coal. There are several mines along both the Peiping-Suiyuan and the Cheng-Tai Railways. The Peiping-Hankow Railway has constructed a number of short branches from the North China Plain into the Shansi hills. Innumerable native mines, often of the most primitive character, supplement the production.

THE TRAGEDY OF THE FORESTS

Much of the Highlands, except perhaps the desert margins, appears to have once been covered with a continuous forest. The only traces remaining today are in the higher and more inaccessible mountains, and in protected temple courtyards and monasteries. Trees will grow in all sections if given a chance, and the traveler is seldom out of sight of at least one or two. Many farmhouses have a few trees, and most of the roads in Kansu are lined with magnificent willows and poplars.

Hillsides are characteristically bare and treeless, more so than in any other section inside the Great Wall. Timber is expensive, and only the barest minimum is available. Its use is restricted to roof beams, simple farm implements, and coffins. Benches, beds, and tables

are made of mud. The development of mining will be seriously handicapped by the scarcity of timbers.

The wanton cutting of the forests has brought another series of misfortunes, apart from the shortage of wood. The removal of the protecting vegetation has permitted erosion to wash soil from steep mountain sides, and to cut deep gullies in the soft loess. Large areas have thus been rendered unfit for cultivation, and the rapid run-off from the bare ground has caused disastrous floods.

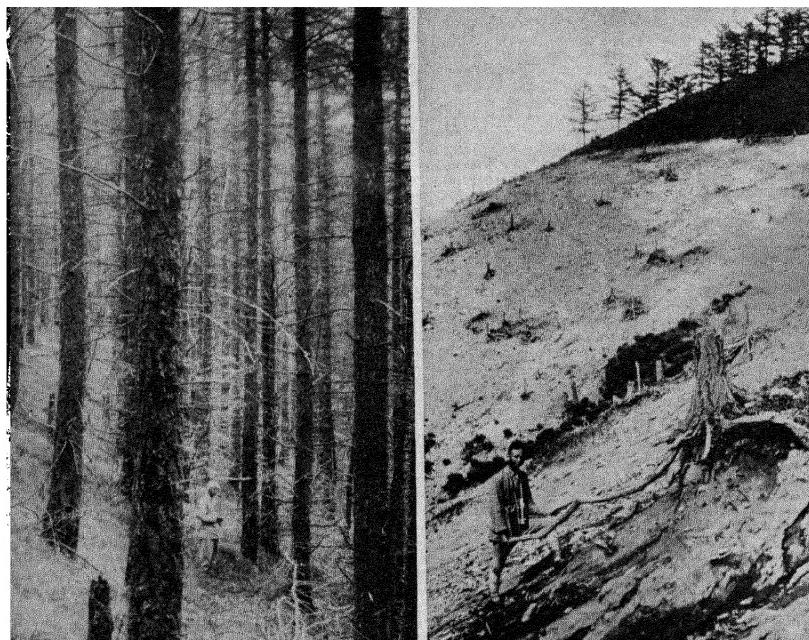


FIG. 91.—Two chapters in a tragedy entitled "From Forest to Desert in a Decade." Forests, in this case of larch, once covered much of North China, but have been cut for the sake of a temporary profit. Once the protective cover is removed, the soil is washed from the steep hillsides. (*W. C. Lowdermilk, courtesy University of Nanking.*)

In those districts where the forests escaped cutting in ancient times, they are being destroyed at present in order to make the land available for cultivation. On steep slopes, only three to five harvests can be obtained before the fields are so badly washed that further cultivation is impossible. The destruction of the forest cover on steeply inclined hillsides is thus a misfortune of the first magnitude. Not only is the raising of crops limited to a few seasons, but the soil is washed down into the valley bottoms where it covers the fertile

fields and makes them entirely unfit for agricultural use. Five years of this process is sufficient to transform a beautiful valley with its prosperous life along a permanent stream, fed from tree-clad hills, into a land of desolation and poverty.

But this is not all. The change in the surface cover probably changes the concentration of the rainfall. In place of gentle showers, the rapid heating of the bare ground produces powerful convection currents so that the rain falls in torrents. Erosion is thus greatly increased. It is sometimes popularly supposed that the cutting of the forests in North China has reduced the rainfall. There is no direct proof of this statement, but it is quite possible, however, that the rainfall is now more concentrated and falls in more sudden showers. Lowdermilk summarizes his studies of run-off and forestation by saying:¹

“The ultimate result of the cultivation of slope lands in Shansi over wide extent and over several centuries of time is thus concluded to have increased the aggregate discharge of the streams. Such increase in run-off has ipso facto reduced the evaporation opportunity within the region affected and has thereby reduced the average amount of precipitation which north China formerly enjoyed.”

The reforestation of the Loess Highlands will be a slow and difficult process. It will not be sufficient merely to plant a few million trees, or even to prohibit the cutting of brush for fuel. Erosion must be checked and centuries must pass before the lost soil can be replaced through normal weathering. All the resources of scientific control and government aid will be needed. Here is a problem which will test the foresight and ability of the Chinese race.

¹ LOWDERMILK, W. C., The Changing Evaporation-Precipitation Cycle of North China, *Journal Engineering Society of China*, XXV (1925-1926), 29.

NOTE. Additional views of the Loess Highlands will be found in Figs. 3, 4, 11, 15, 20 and 61.

CHAPTER IX

THE MOUNTAINS OF SHANTUNG, LIAOTUNG, AND JEHOL

THE PHYSICAL LANDSCAPE

This region consists of three mountainous areas grouped around the Gulf of Chihli or Po Hai, and located in the provinces of Shantung, Liaoning, formerly known as Fengtien, and Jehol, together with the Japanese leased territory of Kwantung. Although among the smaller of the geographic regions of China, its position next to the sea and its proximity to the two most important plains of the country give it a special importance.

The province of Shantung is about equally divided between mountain and plain. The level portion has already been described in connection with the North China Plain. The remaining section is an area of rocky hills and bare mountains with numerous open valleys between them. On the east the mountains form a promontory surrounded on three sides by the sea.

Northeast from Shantung across the Strait of Chihli lies a similar area of mountains in the southern part of the province of Liaoning. These mountains lie east of the Liao Ho Valley, and the region is known as Liaotung, meaning "east of the Liao." The boundary next to the plain of the Liao Ho is sharply defined, but on the north the land forms and human characteristics gradually pass into those of the Mountains of Eastern Manchuria. This transitional line is roughly parallel to, and somewhat north of, the railroad from Mukden to Korea.

The third section lies in southern Jehol, between the North China Plain and the Manchurian Plain, in a region of rocky and rugged mountains. Where the mountains of Jehol join the two plains, the boundary is distinct, although somewhat less so in the northeast than in the south. The eastern limit is along the gulf, between Shanhaikwan and Chinchow. In most places there is a narrow strip of plain along the coast between the mountains and the sea. On the northwest the mountains merge with the Mongolian plateau. This section forms the largest third of the combined geographic region but is of considerably less importance than the areas in Shantung and Liaoning.

The area is 90,761 sq. miles (235,131 sq. km.).

The Mountains of Shantung, Liaotung, and Jehol form a geologic as well as a geographic unit. For the most part, the region is composed of hard ancient rocks which are resistant to weathering. These include metamorphosed sediments and igneous rocks such as granite. Overlying these older formations are patches of younger and softer sediments, in which are found beds of coal. Loess is inconspicuous. Bare rock forms a prominent feature of the landscape. In some districts

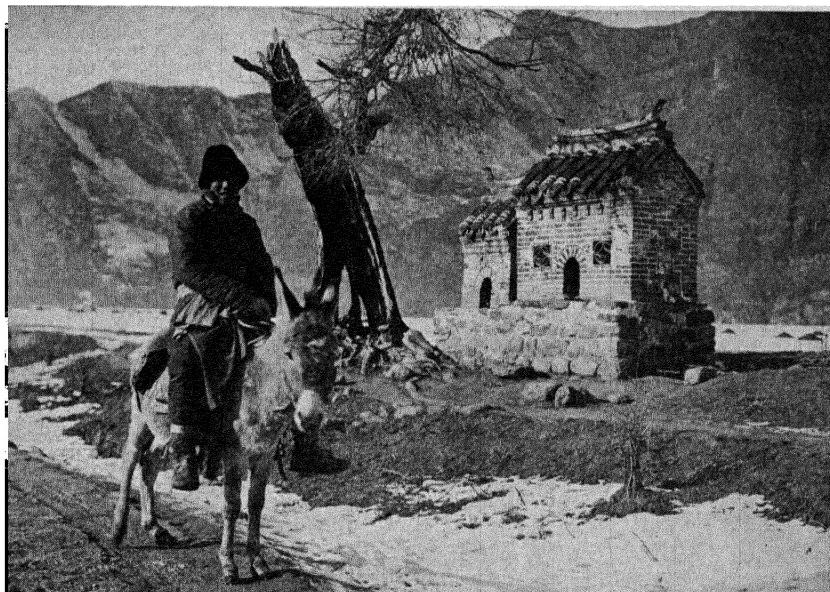


FIG. 92.—Wayside shrines are found along many roads. Although the winter snowfall is light it is welcomed on account of the moisture for the winter wheat. (*Asia Photographic Association*.)

the mountains are high and rugged; elsewhere they have been worn down to rounded hills. Elevations rarely exceed five thousand feet. At least three-fourths of the region is mountainous and undesirable for human use. The steeper slopes have only a little soil, and vegetation is scanty. Such soil as remains is found in alluvial fans, flood plains, and occasional rounded hilltops. Between some of the mountains are wide valleys in which most of the population is concentrated.

The Mountains of Shantung and Liaotung resemble each other in their barren rocky slopes. The lower hills and those cut in the softer sediments have more gentle profiles but still are characterized by the general absence of soil and an uninviting appearance. The ele-

vations in Jehol are higher than elsewhere. In many places the topography is extremely rugged with needlelike spires, and level land is scarce.

The peninsulas of Shantung and Liaotung meet the sea in bold and rocky shore lines. Wave-cut cliffs rise abruptly from the water's edge and isolated hilltops project out of the sea as rocky islands. There are many excellent harbors, but they are usually handicapped by poor communications with the interior.



FIG. 93.—Southern Liaoning is a land of rugged landscapes with limited alluvial plains.
(*South Manchuria Railway*.)

The most famous mountain is Tai Shan in central Shantung. This sacred peak is visited by hundreds of thousands of pilgrims each year and is crowned with temples. This mountain has been formed by a normal fault and rises majestically above the plain to an elevation of 5,060 ft.

ACCESSIBILITY

Mountains are often regions of isolation and backwardness. The land forms of this region tend to restrict communications but, owing to the small size of the three subregions and their relation to the adjoining regions and the sea, access is relatively easy. There are

numerous harbors which are visited by small coastal steamers, especially in the Shantung promontory. The region is fortunate in being bordered by level land, and many valleys extend from the plains up into the mountains, thus forming easy lines of travel.

In Shantung the railroad from Tsingtao to Tsinan serves the edge of the district, and there is an automobile road from Weihsien to Chefoo. Liaotung is correspondingly served by the South Manchuria Railway, which extends north from Dairen. This line is double tracked



FIG. 94.—The gorges of the Lwan Ho in Jehol are sheer and picturesque. Trackers along the shore strain as they slowly drag the boats upstream. (*Ato Photographic Association.*)

and furnishes one of the finest services for freight and passengers of any railroad in Asia. This railroad also operates the line from Mukden to Antung which runs through the central part of Liaoning into Chosen, or Korea.

Owing to their greater size and rugged character, the mountains of Jehol are somewhat more isolated. The Peiping-Liaoning Railway follows the seacoast, but most of its business consists of through traffic between the Manchurian Plain and the parts of China within the Great Wall. A short branch railway leads to the coal mines at Peipiao. The Lwan Ho flows across Jehol, but there are many rapids and navigation is only possible for small flat-bottomed boats. These craft

require two weeks for the trip upstream from Lwanchow to the city of Jehol or Chengteh but come down in three days. There is also an automobile service from Peiping to Chengteh.

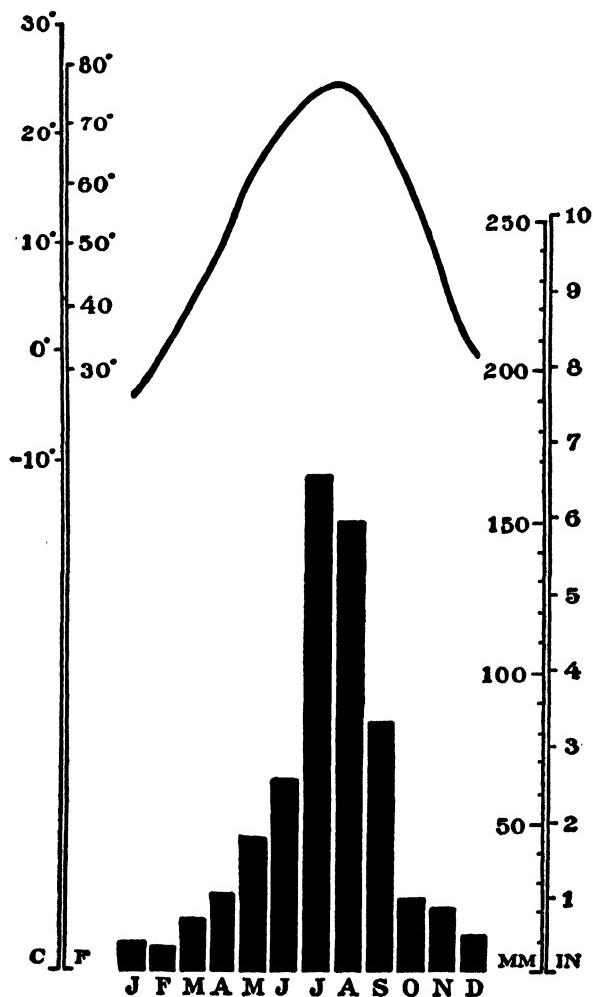


FIG. 95.—Climatic conditions in Shantung, Liaotung, and Jehol. Rainfall averages based on Chefoo (620 mm.), Tsingtao (661 mm.), Dairen (628 mm.), and Chinwangtao (673 mm.). Temperatures for the same stations.

Throughout the region, travel is usually by means of pack animals. Carts are used only in larger valleys, for in the mountains there are only narrow trails.

CLIMATIC CONDITIONS

The nearness to the sea and the mountainous character of this region give it a rainfall slightly higher than that of the adjoining plains. The summer winds are chiefly from the southeast and bring moisture from the ocean. Since, however, the land is usually warmer than the ocean, the winds are not sufficiently cooled to yield a heavy rainfall. The available records are almost entirely from cities on the seacoast or at low elevations inland, and conditions in the mountains are uncertain. Probably the precipitation exceeds 750 mm. (30 in.) in a number of places, but for the whole region the average is less. Most of the rainfall comes during the late summer, but the total varies considerably from year to year. The winter winds blow outward from Mongolia and Siberia and carry little moisture. Before reaching the peninsulas of Shantung and Liaotung, these winds cross the Gulf of Chihli and so pick up some moisture which falls as snow. The amount is not great, but the melted snow moistens the ground for the planting of crops in the spring.

Temperatures are characteristic of North China. The winters are bitterly cold, so that ice forms in the rivers and along the northern shores of the gulf. The summers, in contrast, are uncomfortably warm, with a blazing sun and temperatures which rise to 35°C. (95°F.). The higher mountains are, of course, cooler than the valleys at all seasons, and the climate of Jehol is more pronouncedly continental than in the other sections which are more largely under the influence of the ocean.

Dry and dusty winds are characteristic features during much of the year, and the air is often filled with the yellowish haze so typical of North China.

Owing to the seasonal nature of the rains and the absence of a forest cover on the mountains, streams fluctuate widely in their flow. During most of the year their courses may be dry, while a heavy rainfall may produce a torrential flood for a few days.

AGRICULTURAL ACTIVITIES

Amid these barren mountains, man has made intensive use of all available agricultural land. Terraces have been constructed in some areas to check erosion and pockets of soil are utilized wherever found. Soil conditions vary widely, with areas of slightly saline soils in the flatter valley floors. Little irrigation is possible and cultivation is limited to those staple crops which ripen without extra water.

Wheat, kaoliang, millet, beans, barley, sweet potatoes, peanuts, cotton, and tobacco are important field crops. Melons and excellent pears are grown locally, and it is probable that the orchard industry might be considerably expanded. An important cash crop is wild silk and pongee, produced in Shantung and Liaotung from silkworms which are fed on the leaves of oak trees rather than mulberry.

Despite the handicaps, a large area is under cultivation. The original figures of the Ministry of Agriculture and Commerce for Shantung contain certain obvious exaggerations which have been replaced by an average figure, but the total still remains unexpectedly large. The entire area of cultivated land in the region amounts to 70,043,199 mow (11,673,867 acres). This is 20 per cent of the total area and gives an average of 2.6 mow per person. On the basis of cultivated land alone, the population density amounts to 1,427 people per square mile (549 per square kilometer). This represents the most intensive utilization of available agricultural land of any region in North China.

VANISHING FORESTS

The Mountains of Shantung are treeless and barren. This subregion is today paying a bitter price for the ruthless cutting of past generations. Fuel is too scarce to be used for heating the houses, and, in order to supplement the quick-burning kaoliang stalks which are used for cooking, even the roots of hillside bushes are dug up for fuel.

In Liaotung the situation is almost as bad, but the rainfall is somewhat higher and the population has been rather sparse until recent years. Extensive reforestation is in progress in the Kwantung Leased Territory and along the South Manchuria Railway zone. Those who would learn how to solve one of China's most pressing problems should study the work of the Japanese in this area.

Both in the vicinity of Mukden in Liaoning and in the Eastern Tombs and Weichang districts of Jehol, there were formerly large Imperial Hunting Grounds. Prior to the fall of the Manchu dynasty in 1911, these were splendid forest areas. Since that time, the timber has been ruthlessly destroyed. The more accessible areas have been cut over for the lumber; but on account of poor transportation facilities there has been a great waste, and only timber of a certain size has reached a market. Where costs of carrying out the wood have exceeded its market value, the forests have been wantonly burned to clear the mountains for a transient agriculture. This destructive process is still going on, and the writer has seen valley after valley where ten

thousand spirals of smoke marked burning timber. This destruction is bad enough, but there is no lasting gain, for the rough hillsides are too steep for permanent cultivation. Many pockets of soil are only sufficient for raising half a dozen stalks of kaoliang and will be washed away after a few years.

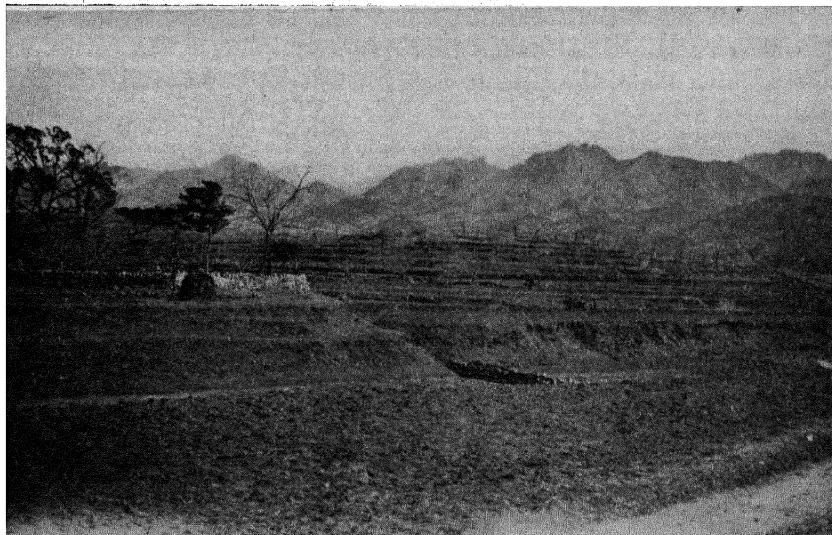


FIG. 96.—Loess terraces border the rocky mountains of Shantung. (*Paul O. Nyhus.*)

MINERAL RESOURCES

All parts of the Mountains of Shantung, Liaotung, and Jehol are well supplied with mineral deposits. The chief resource consists of coal, which is being mined on a large scale at Chunghsing and Tzechwan in Shantung, Peipiao in Jehol, and at Fushun and Penchihu in Liaoning. The coal produced in this single geographic region amounts to half of China's entire output.

The seam at Fushun is especially remarkable, being the thickest bed of bituminous coal in the world. It reaches a maximum of 127 meters (417 ft.). These mines are located 22 miles southeast of Mukden and are the largest in the Far East. Coal has been mined here for more than six hundred years, and it is estimated that the total deposit amounts to a billion tons. The coal is mined in the ordinary way from deep shafts with horizontal galleries, and also in great open surface pits. The production exceeds six million tons a year, about a third of which is shipped to Japan.

Overlying the coal are thick deposits of shale which contains from 6 to 10 per cent of potential petroleum, which may be recovered by distillation. A large refinery has been erected for this purpose, but it is not certain whether the expense of distilling the potential oil may not exceed the value of the oil itself. The entire output is controlled by the Japanese Navy.

The second largest coal mines in China are the Kailan mines in northeastern Hopei. Although topographically on the border of the North China Plain, they are geologically related to Jehol and may be mentioned here.

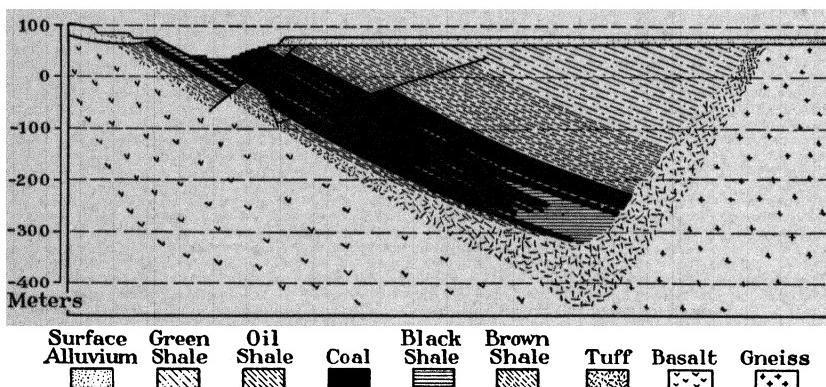


FIG. 97.—Cross section of the Fushun coal deposit, showing the oil shales and great open cut. (*After South Manchuria Railway*)

Deposits of iron ore are present in each one of the subregions, and the production is about a third of China's total. The chief deposits in Liaoning are at Anshan and near Penchihu, where large blast furnaces are in operation. The ore reserves at Anshan amount to several hundred million tons; but unfortunately the quality is poor, for the iron is associated with siliceous rocks, from which it is difficult to separate the metal and much of the ore contains only 40 per cent metal. Similar ores are found in Jehol.

THE GATEWAY BETWEEN LAND AND SEA

This region is the natural outlet to the sea for the North China Plain and the Manchurian Plain, with Tsingtao and Dairen as the chief ports. Both cities have excellent deep-water harbors and splendid communications with the hinterland by rail. They have the disadvantage of being located rather far from their agricultural areas. Tsingtao and Dairen are thus at a disadvantage as compared with

Tientsin and Newchwang, known in Chinese as Yingkow, which lie at the edge of their respective plains. Unfortunately, these latter ports are situated at the mouths of shallow rivers and their harbors are unsuitable for large ships.

A third potential port exists at Hulutao along the Peiping-Mukden Railway in southwestern Liaoning, but it is as yet undeveloped. There is a fairly good natural harbor, which may be commercialized without great expense. Hulutao offers a logical port for western Manchuria and Jehol.



FIG. 98.—The Central Circle in Dairen is representative of Japanese interests in Manchuria. The Yamato Hotel is on the right. (*South Manchuria Railway.*)

The relation of this region to the adjoining areas of Manchuria and North China is well illustrated in its complex political history. Before the opening of the twentieth century, Russia built the Trans-Siberian Railway to the Pacific at Vladivostok. Unfortunately, this port is icebound for four months of the year, and an ice-free port has ever been one of Russia's ambitions. To reach warm water a railroad was built from Harbin on the Chinese Eastern Railway south to Port Arthur. About this time Germany became interested in China and obtained Tsingtao, both as a gateway to the interior and to checkmate Russia. England then followed with a base at Weihaiwei. The next

entrant was Japan, who in 1904 fought a war with Russia for dominance in southern Manchuria. As a result of her victory, Japan obtained the southern half of the new Russian line as far as Changchun and since that time has steadily strengthened her position around Dairen. The World War afforded Japan another opportunity to expand, and for some years she replaced Germany in Tsingtao, but her political concessions in Shantung were surrendered, following the Washington Conference in 1921. Further military operations since 1931 have brought Jehol into the picture. Nearness to the ocean has thus been a significant factor in this geographic area.

TABLE XXIV.—CITIES OF SHANTUNG, LIAOTUNG, AND JEHOL

City and province	"Christian Occupation of China" (1922)	Maritime Customs (1931)	Arnold, "Commercial Handbook" (1926)
Dairen, Kwantung Territory.....	200,000	282,665	186,519
Chefoo (Yintai), Shantung.....	100,000	131,659	90,000
Tsingtao, Shantung.....	90,000	390,337	117,000
Antung, Liaoning.....	70,000	91,015	140,000
Weihaiwei, Shantung.....	.....	190,000	154,662
Chengteh (Jehol), Jehol.....	40,000	.....	80,000
Chihfeng (Hada), Jehol.....	100,000	.....	40,000

The "Manchuria Year Book" for 1931 gives the following information: Port Arthur—**135,126**; Dairen **396,363**; Antung—**143,519**. The 1932 census credits Tsingtao with **418,765**.

The total population of the region is 25,961,242, more than half of whom live in Shantung. The average density is 286 per square mile (110 per square kilometer).

NOTE. Additional views of Shantung, Liaotung and Jehol will be found in Figs. 23, 27, 31, 56, 57, and 67.

CHAPTER X

THE MANCHURIAN PLAIN

THE REGIONAL SITUATION

Within recent years Manchuria has been the boom land of the Orient, with expanding agriculture and keen political rivalries. This old yet new land of Liaoning, formerly Fengtien, Kirin, and Heilung-kiang, stands in striking contrast to the other China south of the Great Wall and presents an amazing picture of pioneer expansion. These three eastern provinces include several distinct geographic regions. Kirin and eastern Liaoning are mountainous; so too are the northern and western margins of Manchuria. Central Manchuria is a broad lowland and forms the subject of this chapter. Beyond the western mountains in Heilungkiang is a district known as Barga, or Hulunpier, which is geographically a part of Mongolia. In northeastern Heilung-kiang and Kirin are other lowlands along the Amur or Heilung Kiang, Sungari or Sunghwa Kiang, and Ussuri which are culturally related to the Maritime Provinces of Siberia.

The thoughtful traveler in the Manchurian Plain finds many contrasts to conditions in the plains of Hopei, Shantung, and Honan. The land does not have that extremely flat appearance which so strikingly characterizes the North China Plain. While central Manchuria is largely a plain, it is relieved here and there by low hills and gentle slopes, with attractive vistas of distant hills, covered with verdure. The Manchurian Plain and the North China Plain have contrasting origins. The latter is the result of long-continued deposition, while much of the former has been produced by erosion. Until recently, this region has been a grassland, with correspondingly rich black soils. Present-day Manchuria is famous as a region of prosperous agriculture.

The contrast extends not only to the soil and the physical landscape but to the human panorama as well. The people wear the same blue clothes and for the most part the houses are still of mud and the agricultural methods simple. Despite this sameness in superficial appearance, there is a different atmosphere. People work more energetically, and there is an invigorating element in the climate unknown farther

south. Relative prosperity and a confidence in the future seem to be characteristic. This produces an enthusiasm which is contagious, and there is a feeling that Manchuria is the land of the future. On all sides, a steadily increasing activity dominates the landscape. The years since 1923 have been very successful for agriculture, and the Manchurian Plain is on the rising tide of prosperity.

Like the courtyard of a Chinese house, the Manchurian Plain is surrounded on all sides except the south, where it has a narrow opening to the sea. The elevation nowhere exceeds 1,000 ft.

The eastern limits of the plain lie parallel to, and not far from, the tracks of the South Manchuria and the southern branch of the Chinese Eastern Railways. In the southeast the plain begins at the head of the Gulf of Chihli near Kaiping and is within sight of the railroad nearly to Mukden or Shenyang. North of Mukden the railroad enters rolling country with mountains usually visible a few miles to the east. In the vicinity of Changchun the boundary lies several miles east of the line and continues northward, irregularly, to the vicinity of Harbin. It crosses the main line of the Chinese Eastern Railway just west of Erhtsengtientze, about 35 miles east from Harbin. The plain extends northeastward down the valley of the Sungari to approximately longitude 128° , where the mountains close in on both banks.

The Khingan Mountains have not been studied in detail, and their relation to the plain is not well-known. The northern limit of the region is near Mergen on the Nonni River, or Nun Kiang, and the boundary crosses the Chinese Eastern Railway east of Chalantun, 250 miles west of Harbin. Many maps indicate prominent spurs extending eastward from the Great Khingan southwest of Tsitsihar along the route of the recently built railroad to Taonan. No such mountains exist, however, and the physiographic boundary is certainly many miles to the west of the railway. About latitude $43^{\circ}30'$, the Khingan Mountains become reduced to low hills and the Manchurian Plain practically joins with the Mongolian tableland in a gentle rise. This is west of Tungliao in longitude 118° . From here the margin of the plain extends southward to Chifeng and thence eastward around the mountains of Jehol to approximately latitude $42^{\circ}30'$, and longitude 122° . The western portion of the Plain is indicated on some maps as the "Eastern Gobi," but it has little in common with the Mongolian plateau.

The southwestern limit of the Manchurian Plain is placed at Chinchow along the Peiping-Liaoning Railway and near the Gulf of Chihli. The cities of Chinchow and Kaiping, which mark the southwestern and southeastern limits of the Manchurian Plain, are but

85 miles apart, while along the Chinese Eastern Railway the region is 285 miles broad.

The area of the Plain is 137,637 sq. miles (356,572 sq. km.).

THE HISTORICAL BACKGROUND

The early history of Manchuria is lost in obscurity. For centuries the country was occupied by a succession of nomadic tribes of Mongols and Manchus, often at war with one another and with their neighbors. Some of these were finally united under Nurhachu, who was born

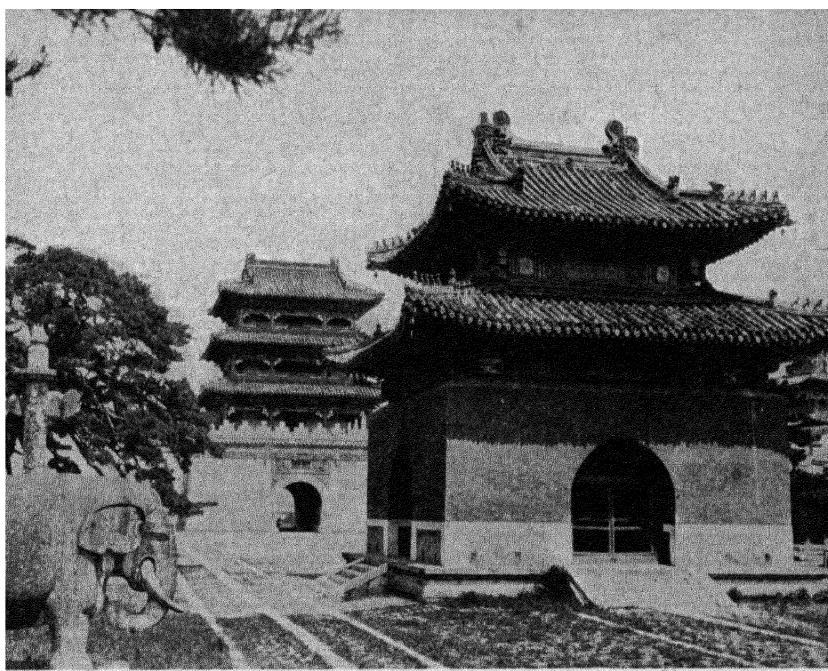


FIG. 99.—The Imperial Manchu tombs outside Mukden are reminders of the part which Manchuria has played in China's history.

in the eastern mountains in 1559. He it was who laid the foundations of the Manchu Empire which burst into China and captured Peiping in 1644, not to be overthrown until the Revolution of 1911.

During the time that the Manchus ruled China, immigration into Manchuria was more or less consistently forbidden, although there has long been a considerable Chinese population south of Mukden. The land was reserved for the ruling race, large numbers of whom, however, came into China to share the prosperity of the court. At

present, the tide has been reversed and Chinese immigrants are pouring into Manchuria in a surging flood. The Manchus today comprise but a small fraction of the population and through long contact have become almost indistinguishable from the Chinese.

For fifty years the ancient land of the Manchus has been involved in political and economic rivalries between Russia, Japan, and China. At the opening of the twentieth century, when Russia built the Chinese Eastern Railway as a link in the Trans-Siberian, the provinces of

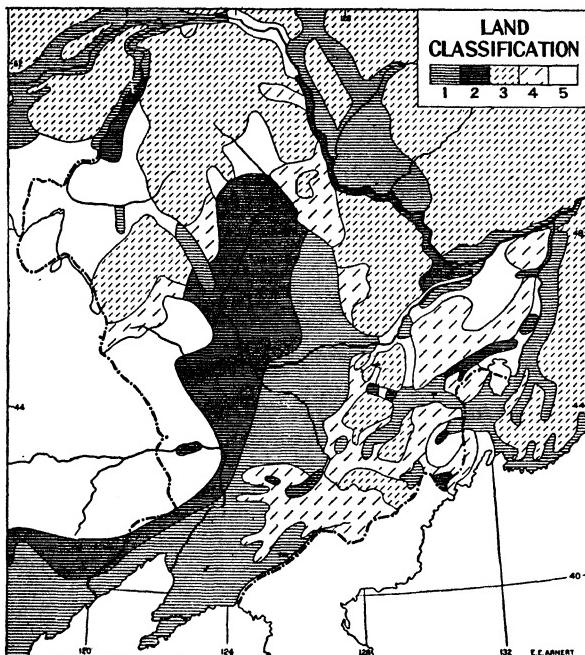


FIG. 100.—Land utilization in Manchuria. 1, land long cultivated; 2, land recently brought under cultivation; 3, areas more than 25 per cent forest covered; 4, areas less than 25 per cent forest covered; 5, non-forested areas (excluding Korea). (E. E. Ahnert in "Pioneer Settlement," courtesy American Geographical Society.)

Heilungkiang and Kirin were almost uninhabited. The city of Harbin did not exist, and its spectacular rise has been largely due to Russian initiative. Harbin is one of the most surprising cities in the world, and with its population of over one hundred thousand Russians it has the largest white population of any city in Asia. Side by side with this thoroughly modern city of the west, so up to date as to be the wonder of every visitor, has grown a typical old-style Chinese town, known as Fuchiatien. The contrast between these two adjoining municipalities is so striking that Hu Shih has spoken of them as

typifying the automobile civilization of the Occident and the ricksha civilization of the Orient.

Until the time of the World War, almost the entire credit for the development of northern Manchuria must be given to the Russians. Since the Russian Revolution, however, Soviet interests in Manchuria have declined, although this region still occupies a place of strategic importance as the gateway to Siberia.

After the Russo-Japanese War of 1904, Japan replaced Russia in southern Manchuria and has steadily strengthened her economic and political position through the construction of railroads, mines, industries, and cultural enterprises. Manchuria is a source of many of the raw materials which Japan so greatly needs for her expanding industrialism. It likewise constitutes an important market for the products of her factories. Dairen is as much a Japanese city as Harbin is Russian.

There seems little likelihood of successful large-scale Japanese emigration to rural Manchuria, outside the leased territory of Kwantung. The Japanese are distinctly a warm-weather people and have not learned to adjust themselves to rigorous climates such as prevail in this region. Furthermore, their standard of living is much higher than that of the Chinese farmer, and attempts at agricultural colonization in Manchuria have completely failed.

The only people who have been able to compete with the Chinese farmer are the Koreans. Their standard of living is even lower than that of the Chinese and large numbers of them are coming across the border into eastern Liaoning.

The Chinese occupation of Manchuria has not moved so rapidly as did that of the Russians, who are more adventuresome pioneers. The Chinese are essentially a village folk, and the agricultural frontier has advanced only as the land has been more or less completely occupied. Walled towns have grown up along the rivers or other lines of transportation and have closely corresponded to city patterns of the homeland. The modern cities of Manchuria are all related to railroad stations which are often some distance outside the walls of the original settlement.

Despite the turn of events since 1931, it seems unlikely that Manchuria will cease to be Chinese in race or culture. If that possibility ever existed, it has been eliminated by the great migration of recent years and by China's growing national consciousness. Whether or not China can secure political and economic dominance in the immediate future is another question, but of the eventual outcome there appears little doubt. All geographic signs would seem to point

to China as the ultimate political, industrial, and cultural power in the Orient. When that day of leadership comes, it will be most unfortunate if any of her neighbors are found trespassing.

According to the Post Office estimates of 1926, the population of the three Manchurian provinces amounted to 24,040,819. This is thought to have risen to approximately 29,198,000 by the year 1930 ("Manchuria Year Book," 1931). More than 95 per cent are Chinese, the remainder including Manchus and Mongols, now almost completely absorbed into Chinese culture, as well as Russians, Japanese, and Koreans. The Russians and Japanese are almost entirely confined to the large cities, such as Dairen and Harbin, or are scattered in various industrial enterprises along the railways. The Japanese population is slightly over 200,000. In addition there are about 600,000 Korean farmers.

TABLE XXV.—CITIES OF THE MANCHURIAN PLAIN

City and province	"Christian Occupation of China" (1922)	"Manchuria Year Book" (1931)	Other estimates with source
Mukden (Shenyang), Liaoning	250,000	418,182	200,000 (Arnold, 1926)
Harbin (Pinkiang), Kirin	200,000	384,572	330,436 (Customs, 1931)
Changchun (Kwanchengtze), Kirin	70,000	128,040	
Yingkow (Newchwang), Liaoning	80,000	110,535	106,040 (Customs, 1931)
Tsitsihar (Lungkiang), Heilung-king	50,000	89,604	40,000 (Arnold, 1926)
Liaoyuan (Chengchiatun), Liaoning	70,000	.....
Chinchow (Chinhhsien), Liaoning	60,000	.....	100,000 (Shun Pao)
Liaoyang, Liaoning	40,000	.....
Tungliao (Baiyantala), Liaoning . . . . .	.....	.....	123,406 (Shun Pao)
Taonan, Liaoning . . . . .	.....	.....	118,500 (Shun Pao)

COMMUNICATIONS, OLD AND NEW

Manchuria leads all China in active railway construction. Several hundred miles are being built each year, and the length of railroads in Manchuria in 1930 amounted to 6,987 km., out of total of 17,488 for all China.¹

¹ CLARK, GROVER, "Economic Rivalries in Manchuria," New Haven: Yale University Press, (1932), 18.

The three chief railways are the Chinese Eastern in the north, the South Manchuria in the southeast, and the Peiping-Liaoning (formerly Peking-Mukden) in the southwest. These lines represent Russian, Japanese, and Chinese influence, respectively, and associated with each railway are numerous branch lines and subsidiary enterprises.

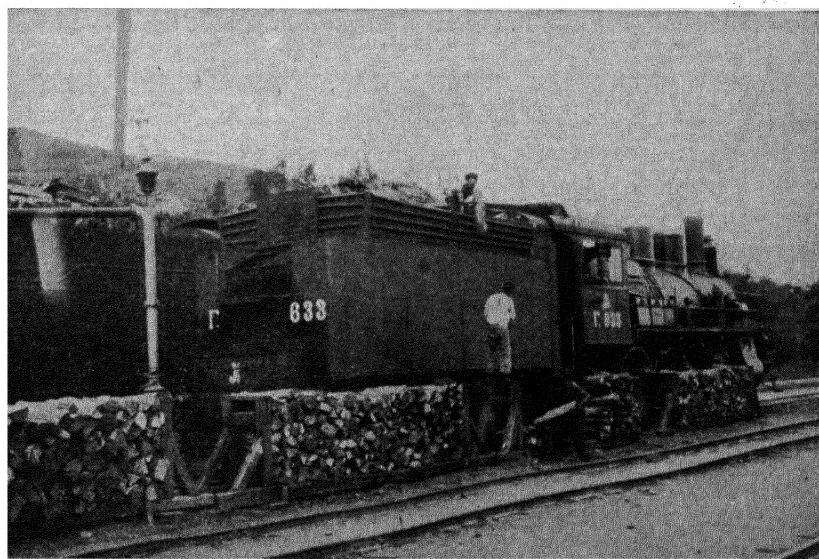


FIG. 101.—Locomotives on the broad-gage Russian-built Chinese Eastern Railway largely burn wood.

The Russian and Japanese companies are more than railways, for they operate agricultural experiment stations, mines, industries, shipping, and schools. To them must be given much of the credit for the development of Manchuria. These enterprises have increased trade and proved enormously profitable for the railways themselves. Even more, however, these activities have brought prosperity to the Chinese who make up the bulk of the population.

In addition to these major lines, there are a number of shorter roads, built with either Japanese or Chinese capital. It is the rapid development of these lines since 1925 which has given Manchuria such a complete railway net.

These railways provide six outlets for Manchuria. Two of these are along the Chinese Eastern Railway and lead into Soviet territory. During and after the Russian Revolution, the western border was closed, and even today there is little trade with the Union of Socialist Soviet Republics. On the east the situation is different, for large

quantities of beans and wheat are exported to Europe via Vladivostok. The third and fourth outlets are by way of the South Manchuria Railway, southward to Dairen and southeast to Korea. The city of Dairen, at the southern end of the South Manchuria Railway, is the outstanding port of the region and now ranks next to Shanghai as the second city of China in the volume of its foreign trade. The fifth route is via the Peiping-Liaoning Railway. This line provides an all-

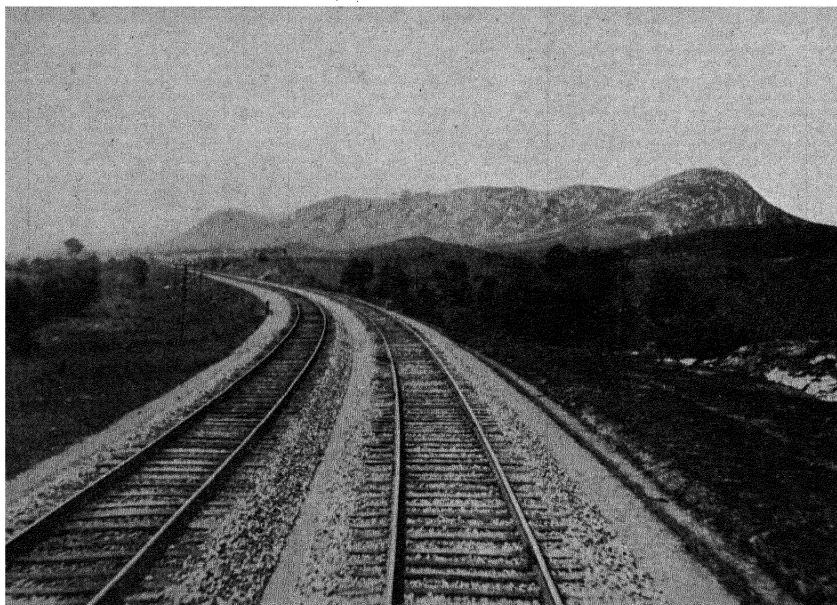


FIG. 102.—The double-tracked South Manchuria Railway, owned by the Japanese, is the principal gateway to Manchuria.

rail route to central China and carries a heavy freight and passenger traffic. At Hulutao, just south of Chinchow, there is a harbor which may some day partially displace Dairen as a port for western Manchuria. It lies near the Peiping-Liaoning Railway, but as yet it is undeveloped and forms only a potential rival to Dairen. The sixth and newest of these gateways lies in eastern Kirin where the Chang-chun-Kirin-Tunhua line has been extended to meet a Korean road to the new port of Rashin, which is nearer Japan than is Dairen.

The historic port of Manchuria is at Yingkow, or Newchwang, at the entrance to the Liao Ho. This is still an important harbor for junks, but the river is too shallow for large steamers. It is connected by branch lines with both the Peiping-Liaoning and the South

Manchuria Railways. Various proposals have been made to dredge the harbor, but the cost is almost prohibitive.

The chief rivers of the plain are the Liao and the Sungari, with its tributary the Nonni. The volume of the rivers is subject to wide fluctuation according to the season. The Sungari is navigable for shallow-draft steamers from above Harbin to the junction with the Amur, or Heilung Kiang, and there are nearly a hundred of these

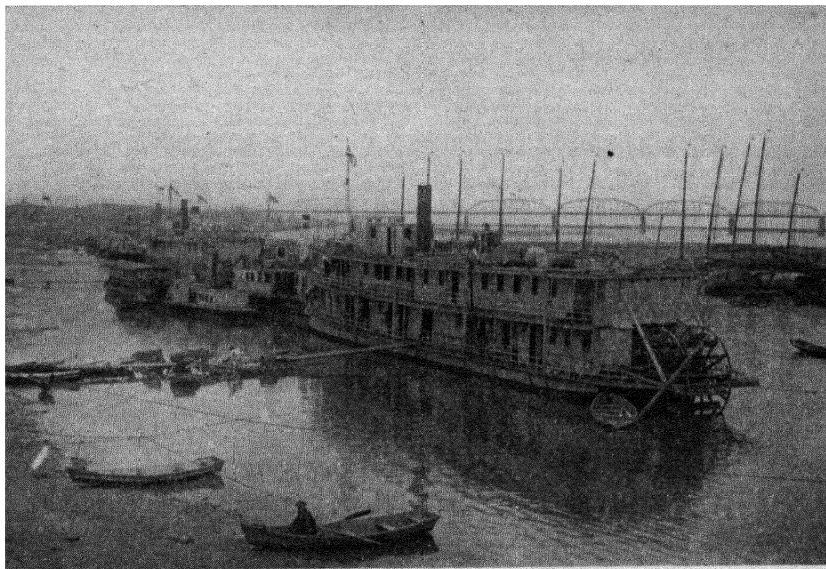


FIG. 103.—The Sungari River at Harbin, with steamboats and the bridge of the Chinese Eastern Railway. (*Atto Photographic Association.*)

vessels. Prior to the construction of railroads, the rivers were of relatively greater importance, but they are still extensively used for shipments of beans and cereals.

Cart roads are very poor and seldom consist of more than a series of ruts which meander across the countryside. When one pair of tracks becomes impassable, another set of grooves is started alongside. A road may thus have a dozen or more tracks and be a hundred yards wide. The abundance of land which this implies is in striking contrast to South China, where the country is so crowded that only narrow strips of land can be spared from the rice fields. In summer the rains convert these Manchurian roads into a quagmire, and travel becomes impossible for weeks. Conditions are most favorable in the winter when the ground is frozen. At this season, the ice-covered rivers provide an even better highway than the land, so that there is little inducement

to improve the dirt roads. The carts are the familiar two-wheeled vehicles of North China, either with wheels of solid wood or with spokes. Carts of this kind carry up to four tons of cargo, in which case they are pulled by as many as eight or ten animals. The usual load is two tons with four to six horses or mules.

The principal freight consists of the agricultural products, such as beans, of which the region produces a large surplus. Since these are exported during the fall and winter when the farmers have no other occupation, transportation by cart in some years is even cheaper than shipment by railroad.

MIGRATION

Manchuria is one of the outstanding pioneer belts of the world and forms almost the last area of new farm land in southeastern Asia. This is particularly true of Heilungkiang and western Liaoning where there are still great areas of virgin prairie. Manchuria is China's "Great West," and within the past decade the migration of people from the congested and war-torn provinces of intramural China has become one of the most amazing population movements of modern history.

The existence of this attractive and unoccupied land so near to the teeming plains of China presents a curious phenomenon. The Manchus long endeavored to forbid immigration, and while the barrier to Chinese penetration was removed in 1878, settlement has been encouraged only since 1900. The great influx of people to Manchuria has been especially pronounced since 1923, and the incoming Chinese agriculturalists are rapidly pushing back the original nomadic tribes.

The early migration was in response to the need for laborers in the construction of railroads, the development of natural resources, and the requirements of agriculture. On account of the severity of the winter weather, the labor demand was highly seasonal. The movement of coolies from Shantung and Hopei usually commenced in February, shortly after the holidays of the old Chinese New Year, and continued through the spring. After the harvests in the fall and with the advent of cold weather, a large proportion of the laborers returned to their homes in the south. Within recent years more and more of the newcomers have remained in Manchuria as permanent settlers.

About two-thirds of the immigrants enter Manchuria by sea and a third come overland. Those arriving by boat come from Tsingtao, Chefoo, or Tientsin to Dairen or Yingkow, while those coming overland travel on the Peiping-Liaoning Railway or journey on foot. The

best estimates of the numbers involved are those of the South Manchuria Railway Research Bureau, given in Table XXVI. In the years from 1923 to 1929 the arrivals numbered approximately 5,219,278, of whom 54.8 per cent have remained in the Northland. Most of these immigrants are men, but the total of women and children arriving at Dairen rose from 7 per cent in 1925 to 17 per cent in 1927. Few of those who bring their families return to their old homes.

TABLE XXVI.—CHINESE MIGRATION TO AND FROM MANCHURIA

Year	Total entered	Total departed	Number remaining	Percentage remaining
1923	433,689	240,565	193,124	44.5
1924	482,470	200,035	282,435	58.6
1925	532,770	237,746	295,024	55.4
1926	607,352	323,694	283,658	46.8
1927	1,178,254	341,959	836,295	71.0
1928	938,472	394,247	544,225	58.0
1929	1,046,271	621,877	424,394	40.6
Seven years total	5,219,278	2,360,123	2,859,155	54.8

Source: South Manchuria Railway Research Bureau.

Migration has been aided by the low rates for transportation. Deck passage on boats from Tsingtao or Chefoo to Dairen costs but a yuan or two and the South Manchuria Railway has granted very low fares for colonists and even carries children and old people free of charge. Even these reduced rates are prohibitive for many families, and about half the people go on foot all or part of the way.

It is a common sight along the overland road through Shanhaikwan to see family after family trudging along with all their worldly possessions loaded high on a creaking wheelbarrow. One side carries a collection of pots and farm tools, while on the other side one may often see an aged grandparent and one or two of the children who are too young to walk. The head of the family toils between the shafts, while his wife hobbles along on foot. To help along the wheelbarrow, some of the children tug at ropes in front, or in a few cases a mule or burro may also be harnessed to this overloaded vehicle. Many immigrants have not even a wheelbarrow and carry their scanty belongings in a little bundle swung from a stick over their shoulders. The misfortunes of many of these people are pitiful, for they have waited until they were destitute before starting and know little of where they are going.

Southern Manchuria is now practically full and the most attractive remaining areas lie in northwestern Liaoning around Taanon,

in Heilungkiang northwest of Harbin, and in Kirin. The governments of these regions have encouraged settlement and have sent proclamations to all parts of North China inviting immigrants to settle on their lands. In some cases farms may be rented for a nominal figure; elsewhere the land has been given free of charge to any who would come and cultivate the soil. As a further attraction, some districts have even offered free houses, the loan of agricultural implements, and financial assistance. In most cases these official proclamations have consisted of bona fide inducements, but others have been merely paper promises.



FIG. 104.—Northward-bound Shantung emigrants pay a yuan or two for deck passage to Dairen. (*South Manchuria Railway*.)

The factors which lie behind this northward migration are many and complex. They are based in part upon the unfortunate conditions in Shantung, Hopei, and Honan. For a number of years these provinces have been repeatedly devastated by warring armies and hordes of bandits. The situation has been rendered worse by crop failures and famine conditions. Equally significant is the basic fact of a population with nearly a thousand people to each square mile of cultivated land. All these conditions have combined to push the surplus population out of the North China Plain. Some of the emigrants have gone into the northwestern provinces along the borders of Mongolia, but the larger share have migrated to the three provinces of Manchuria.

Equally important with this pressure from behind is the economic magnetism of Manchuria itself. Free land is unheard of inside the Great Wall, and the undeveloped country of the northeast offers possibilities far beyond those which the ordinary farmer of North China might secure at home. Manchuria as a whole has a population of 70 per square mile, and, while extensive areas around the margins are mountainous or incapable of agricultural development, the density of rural population is much below that of the North China Plain.

Manchuria offers almost the only possibility of extensive colonization for overcrowded China, since Mongolia and Sinkiang are too



FIG. 105.—This scene is from a poster, widely distributed by one of the newer Manchurian railways, which invites colonists to the pioneer fringe. Railway transportation is transforming the grazing land of the nomad. (*Taonan-Tsitsihar Railway*.)

arid and Tibet is too cold. In the words of Dr. Hsu Shuhsing, "China cannot afford to share the control of Manchuria with any nation."

The rapid colonization of Manchuria presents a phenomenon paralleled only by the United States and nowhere equaled in the world today. For the most part, these immigrants have consisted of the lower strata of society who have been so impoverished by famine, banditry, and excessive taxation that they are almost without hope. It is especially noticeable in the case of Shantung that the outflow increases with internal disorders, while the return tide is greatest during times of peace. Only a small proportion of the immigrants are of the more

ambitious and pioneering elements of the North China Plain. The character and ability of these people will certainly have its bearing upon the future history of the region. In so far as the movement consists of the more impoverished and incapable elements of North China rather than the able and successful classes, Manchuria can scarcely be expected to develop any superior type of civilization. It should be remembered that in the early colonization of North America a large percentage of the immigrants were composed of the more capable and energetic elements of Europe.

A HARD CLIMATE

The climate of the Manchurian Plain is pronouncedly seasonal and continental. Although located in the same latitude as Spain and France, conditions are far different from these west coast countries where temperatures are influenced by the ocean. In this region the climate is largely controlled by continental conditions, and there are marked contrasts between summer and winter. From October to March the winds are from the north and bring cold, dry air from Siberia. Fortunately they are seldom strong. Summer winds blow from the south and southeast and are moist.

The winters are long and bitterly cold, with minimum temperatures far below freezing. The day and night January average in Harbin is -18°C . (0°F .) and at Mukden only -13°C . (11°F .). Extremely low temperatures are recorded during the winter, especially in the far north where the temperature frequently falls to -35°C . (-30°F .). The rivers are frozen from the end of November until the beginning of April, and ice forms 6 ft. thick. The cold is less intense in central Manchuria and decreases considerably near the Gulf of Chihli. Fortunately the sky is clear.

Summers are short and only about five months are free from frost. The day and night average for July at Harbin is 22°C . (72°F .) and at Mukden 24°C . (75°F .). The summer maximum is high in all parts of the plain and frequently exceeds 35°C . (95°F .).

The distribution of precipitation throughout the year is very uneven. During the winter the snowfall is light and the spring is usually characterized by drought. Most of the rain occurs during the summer months, with half of the annual total in July and August. Summer arrives suddenly with the rains and is followed by a dry autumn which aids in the harvesting of the late cereals. The annual precipitation is about 500 mm. (20 in.), decreasing from 600 mm. (24 in.) in the east to 400 mm. (16 in.) in the west. The western portion is semiarid, so that agriculture will always be somewhat limited.

Temperature changes are frequent and abrupt. Warm summer weather occasionally reappears in the late autumn and acute cold may be felt in the early summer. Even within twenty-four hours there may be a change in the temperature of as much as $28^{\circ}\text{C}.$ ($50^{\circ}\text{F}.$).

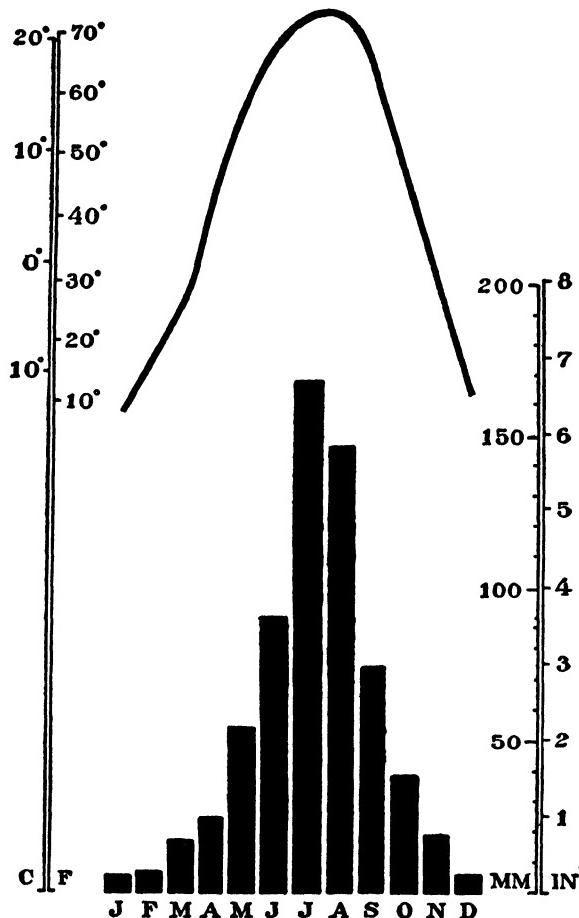


FIG. 106.—Climatic conditions in the Manchurian Plain. Rainfall computed from data for Yingkow (639 mm.), Mukden (672 mm.), Kungchuling (618 mm.), and Harbin (597 mm.). Temperatures for the same stations omitting Kungchuling.

These fluctuations have an unfavorable effect on vegetation, but the regularity of the summer rains make crop failures uncommon. Fortunately the region is far enough north so that there are long hours of sunshine during the summer.

Although the rainfall is limited, it comes at the right season. Furthermore, the lower temperatures of this latitude somewhat

reduce evaporation so that soil moisture is not lost so rapidly and a given amount of rainfall goes further than in South China.

Two climatic factors restrict agriculture in the Manchurian Plain—frost and drought. The northern portion of the region has a growing season of no more than 125 days, which is short for a diversified agriculture. The average frost-free period for the entire Plain is but 150 days. Toward the west, in the vicinity of Tsitsihar, Taonan, and Tungliao, the rainfall permits crops to be raised only in the more favored years. This dryness is reflected in the soil, much of which is alkaline.

The long winters impose a restriction upon human activities which is one of the most serious handicaps of the Manchurian Plain. For four months the temperature makes most outdoor work impossible, and one can only sit by the fire and wait. How to overcome this winter idleness is an unsolved problem.

EXPANDING AGRICULTURE

Until recently the Manchurian Plain has contained some of the finest undeveloped agricultural land in the world. The extreme southern part of Manchuria, in the vicinity of Liaoyang, has been inhabited by Chinese for several centuries, but the greater portion of the region has been occupied only by scattered nomads. The most unique characteristic of the Manchurian Plain has been the presence of these uncultivated grasslands. Large areas are still virgin prairie, but the nomadic Manchus and Mongols are rapidly being pushed out of the land which has agricultural possibilities. Owing to the rigorous winter agriculture is restricted to spring planted crops. The soil is black with humus, and crops grow luxuriantly. With rich soils and a favorable summer climate, cultivation is carried on with great success. Manchuria today is a great pioneering region of expanding agriculture.

The average area of cultivated land per person is 6.4 mow (1.07 acres). This tells a story in itself, for it indicates the large-scale agriculture which characterizes the Manchurian Plain. This is three times the average per capita area in the Yangtze Valley and more than six times that for the vicinity of Canton.

This is the only section of China where modern farm machinery is being used, although machine cultivation is still in its beginnings. As a result of these conditions, the average production per person far exceeds that of any other section of China. This brings a corresponding contrast in prosperity, giving the producer a margin beyond his own minimum needs. The cultivated area is rapidly increasing, and this

region has great possibilities for the production of agricultural products by extensive scientific methods.

Almost every farm has several draft animals and the total for the entire Plain was over three million in 1915—greater than that of any other region in China. Horses and mules are the common draft animals, with oxen and donkeys of lesser importance.



FIG. 107.—Manchurian fields are sometimes a mile long. These furrows are maintained year after year and are used for millet and kaoliang. (*Robert L. Pendleton from Orient and Occident.*)

The chief crops are kaoliang, soy beans, millet, wheat, and corn, in the order of their importance. Kaoliang forms the staple food of the population. Before beans became important, kaoliang occupied nearly half of the cultivated land, and considerable quantities were exported to other parts of China. Owing to the increasing importance of soy beans, the percentage of land devoted to kaoliang has diminished, and the crop area now averages about 25 per cent of the entire cultivated land. The figure increases from 15 per cent in the north to 30 per cent in the south.

Soy beans are the great cash crop of Manchuria and rank ahead of silk as China's largest export. They form the basis of the outstanding prosperity which Manchuria has enjoyed within recent years, and the production is rapidly increasing. Beans occupy over 25 per cent of the cultivated land and are especially important in the northern

part of the Plain. Soy beans are an example of a crop which is raised primarily for its industrial uses rather than for its value as human food. Soy beans have been known in China for thousands of years, but it is only since 1908 that shipments have been made to Europe and America. The export of beans and bean cake exceeded 4 million tons in 1931. In 1928-1929 the Chinese production amounted to 86 per cent of the world total.



FIG. 108.—Soy beans are the foundation of Manchuria's remarkable prosperity. During the winter, when the roads are frozen, farmers bring their beans to the railway stations, as at Kaiyuan. (*South Manchuria Railway*.)

The bean is valued for its high protein content, about 40 per cent, and its oil, which, as the result of much experimenting, now amounts to between 15 and 20 per cent. This oil is used in the manufacture of a great variety of products, ranging from paints, explosives, and celluloid to high-grade soap, Worcestershire sauce, and butter substitutes. Other products made from soy beans include vegetable milk, flour, and cereals. The oil is extracted by chemical processes or in great presses and the residue made into cakes and used as a fertilizer. Large amounts of bean cake are shipped to Japan for enriching the mulberry, the leaves of which are fed to silkworms.

Excellent wheat is grown in the north where it has been introduced by the Russians and occupies as much as 15 to 20 per cent of the cultivated land. Wheat is the second cash crop and some flour is

exported in good years. Millet is grown in all parts of the region, but most of it is consumed locally, some being sold to Korea. The crop area exceeds 15 per cent. In addition to the foregoing standard crops, corn and barley are also raised for local consumption. The cultivation of rice has been introduced by the Japanese and the Koreans but has not become an important crop. As far as climate is concerned, rice will grow as far north as Vladivostok; its unimportance in North China is due to custom and to sandy soil which makes flooded fields difficult. Some of the Manchurian rice is raised on dry fields without irrigation.

The preceding crop percentages are based upon hsien figures of the Ministry of Agriculture and Commerce. Estimates for seventeen areas collected by Nyhus average as follows:¹ beans, 33 per cent; kaoliang, 23 per cent; millet, 17 per cent; corn, 7 per cent; and wheat, 10 per cent.

The cultivated area in 1915 amounted to 77,247,769 mow (12,874,-628 acres) To this may be added 22,668,554 mow for the Mountains of Eastern Manchuria, giving 99,936,323 mow for two regions. In comparison, the estimates of the Nanking Directorate of Statistics for 1932 place the total for Heilungkiang, Kirin, and Liaoning at 187,-740,000 mow (31,290,000 acres). This suggests a doubling of the cultivated area in less than twenty years.

The extent of the arable land which remains undeveloped is uncertain. Chu Hsiao² quotes The Statistical Society of Japan as estimating the cultivable area of the three provinces at 54,900,000 acres. Other figures run to twice this area. Even if statistics could be secured, there is uncertainty as to the relative value of the land, for the totals would include areas of sandy or alkaline soil and other tracts which are too hilly, too cold, or too dry. Parts of south Manchuria are already full to overflowing. Most of the land near the older railroads and the navigable rivers is also taken up. The best of the remaining country is in the north and west, where isolation retards development and where problems of decreasing rainfall and increasingly cold winters raise serious questions. The cream of Manchuria is already occupied.

Agricultural expansion will doubtless continue for several decades, but at a diminishing rate. Within a few years the best of the uncultivated land will have been appropriated. Increased agricultural production will then result from dividing up the larger farms, the reclamation of the less desirable areas, and better farm methods.

¹ NYHUS, PAUL, "Cropping Systems and Regional Agriculture in China," Washington: Bureau of Agricultural Economics (1931).

² CHU HSIAO, Manchuria, a Statistical Survey, in "Problems of the Pacific, 1929," 388.

THE SIMILARITY TO NORTH AMERICA

In many ways Manchuria resembles central North America. The richness of the soil, the similarity in vegetation, the invigorating climate, and the "newness" all strikingly remind the traveler from the United States of conditions in America. The rest of China has little in common with the lands across the Pacific, but the landscape in Manchuria has a familiar feel. Mukden is at the same latitude as Chicago, while Dairen corresponds to Baltimore, and Harbin to Montreal.

The similarity extends to land forms as well, and Manchuria may be regarded as a compressed cross section of North America. The mountains of Kirin in the east resemble the Appalachians in their general appearance and forest cover. The central plain of Liaoning is much like the Mississippi Valley in Illinois, Iowa, and Kansas, with the northern part of the plain in Heilungkiang resembling southern Canada. The western portion of these plains is marked by increasing aridity in both continents, and the western Manchurian Plain duplicates the uncertain agricultural conditions of Wyoming. The Khingan Mountains are much lower than the Rockies, but to the west of each range there lies a great desert.

This resemblance is of more than passing interest, for it bears directly upon the future possibilities of Manchuria. During the past century North America has undergone a most amazing transformation. What was formerly a wilderness is now a land of prosperous agriculture and great cities. Nowhere in the world has there ever been such a marvelous change from almost uninhabited forests and prairies to such bountiful prosperity. This remarkable change has been due to many causes, but one of the major factors has been the abundance of free rich land. The physical conditions in China's new northland of Manchuria appear in many ways to duplicate America's "great West" of a century ago. Similar developments may thus be possible. Whether this transformation actually takes place in Manchuria will depend largely upon the human element.

WHAT OF THE FUTURE?

Manchuria forms a fascinating geographical laboratory. The history of this region during the twentieth century will offer a gigantic experiment in the relationship between race and place. Nature has provided a favorable environment with rich soil, abundant mineral resources, a climate which is stimulating although perhaps too cold during the winter, and most important of all a great area of undevel-

oped land. Nowhere else is there an equally favorable opportunity for developing a new and better China.

It appears certain that the Manchurian Plain will have a great future. Just how significant that future is to be, however, depends after all upon the people who live there. Have they been lured by the opportunities or pushed by compulsion from their old homes? To a certain extent the immigrants at present are merely transplanting their old cultures to this new soil. The new environment, however, calls for certain readjustments, so that social and economic changes of great significance are possible.



FIG. 109.—Kitaiskaya Street in Russianized Harbin, the largest white city in Asia.
(*South Manchuria Railway.*)

Do these newcomers possess the genius to take advantage of that which nature has provided for them? What is the relationship between race and place, between inherent human ability and the stimulus of a more favorable environment? It may be that this great experiment will furnish a partial answer to the problem of how far the character of a people is due to geographic influence and how far inheritance dominates.

Are these incoming farmers the pioneers of a new civilization which will set fresh standards of human happiness and progress?

Manchuria contains not only Chinese but several hundred thousand Russians and Japanese as well. How do these races compare with the Chinese in their ability to develop the agriculture, commerce, and industry of this new land? The Russians and the Japanese must be given credit for most of the large-scale material development which has taken place so far. Will the Chinese race prove itself equal or superior in the future?

The possibilities of the Manchurian Plain are not limitless. It must be emphasized that there can be no distinctive future if this region becomes as overcrowded as other parts of China. The hope of Manchuria lies in a limited population, for only then can there be the opportunity of large per capita production. The regulation of immigration will soon become a deciding factor. The door of opportunity is still open today, but there are already signs that it shortly will begin to close.

This region offers a testing ground of huge proportions and significant possibilities. The world may well judge the fundamental ability of the Chinese race by what they accomplish here.

CHAPTER XI

THE MOUNTAINS OF EASTERN MANCHURIA

GENERAL FEATURES

The Mountains of Eastern Manchuria are a partly developed region with the greatest resources of timber in all China. The mountains share with all Manchuria the characteristics of pioneer settlement, but amid these highlands agricultural possibilities are much restricted. Large sections in the north have never been properly explored and are visited only by occasional hunters or woodsmen.

The characteristic landscape is one of beautiful tree-clad mountains. These mountains are in geologic maturity with occasional open valleys and a relief of several thousand feet. Clear streams and tall forests form a distinctive part of the picture. Over much of the area the landscape has been unaffected by the hand of man and nature has retained full play. Cultivation is generally limited to the valley floors.

These mountains consist of a series of high ranges along the border of China in eastern Kirin and northeastern Liaoning. They lie between Korea or Chosen and the Maritime Provinces of Russia on the east, and the valleys of the Liao and Sungari on the west, touching both the Manchurian Plain and the Khingan Mountains. Toward the Manchurian Plain, the region is composed of rounded hills and open valleys which farther east pass into higher mountains. This mountain mass is composed of hard ancient metamorphic rocks overlaid here and there by Tertiary coal-bearing formations. The chief ranges are the Tienpao Shan and the Changpai Shan, the latter of which reaches an elevation of 2,400 meters (8,000 ft.). In some sections, the scenery is characterized by rugged peaks and precipitous cliffs which combine to make the region one of exceptional beauty. The highest peak is the volcanic cone of Paitou Shan, in whose snow-covered summit lies a beautiful crater lake. There is no volcanic activity at present.

The mountains are drained by three river systems. In the southeast the Yalu Kiang marks the boundary between China and Korea, while in the northeast the Ussuri River separates China from Siberia. The most important river is the Sungari, together with its tributary the Hurka. These last two streams have their origin in the Tienpao

Shan, and their valleys broaden into plains in the vicinity of the cities of Kirin and Ninguta.

Most of the land which is available for cultivation is in the west, where the valleys are broader and the slopes gentler, or in the central valleys. The more inaccessible mountains are practically uninhabited and most of the population is confined to the valleys near the Manchurian Plain. The area is 100,060 sq. miles (259,222 sq. km.), and the population amounted to 4,692,805 in 1926. This gives an average density of 47 people to the square mile (18 to the square kilometer).



FIG. 110.—The broad valley of the Yalu Kiang attracts farmers in a region otherwise largely mountainous. (*Ato Photographic Association.*)

ISOLATION AND INACCESSIBILITY

Isolation is a dominant factor in the natural setting of this region. The forests are almost inaccessible during the summer on account of the marshy soil and the thick tangle of bushes and fallen trees. In the winter the ground is frozen and the cover of snow makes travel somewhat easier. These difficulties of soil and surface seem to be a conspiracy of nature against the intruder, whether lumberman or farmer.

Within recent years, railroads have opened up several parts of the region. The construction of the Trans-Siberian Railway about the

beginning of the century formed a path across the northern section, but there have been very few settlers even up to the present, so that the railway has brought little development aside from lumbering and mining. The railway from Korea to Mukden lies near the southern margin of the area, and the proximity to the crowded lands of China and Korea has brought a large influx of immigrants.

Two other railroads, more recently constructed, occupy significant positions. One of these is from Changchun through Kirin to Korea and the new Japanese port of Rashin. This new harbor will provide a new outlet for Manchuria and may rival the Russian port of Vladivostok and partially replace Dairen for trade between Manchuria and Japan. Another line, under purely Chinese direction, has been built from Mukden to Hailung and Kirin, opening up the southeast. These new means of travel will revolutionize the life of the region and will provide outlets for an increased production of forest and agricultural products. The railways will also make possible the development of mining and agriculture.

The chief city of the region is Kirin (Yungki), with a population estimated in the "Christian Occupation of China" at 83,000, and by the 1931 "Manchuria Year Book" as 190,952. Other centers are Ninguta and Tunhwa.

POTENTIAL WEALTH IN FOREST AND MINE

The Mountains of Eastern Manchuria contain some of the finest timber in all China. Except where the trees have been cut or where fires have devastated the land, the mountains are covered with magnificent forests. This region has the largest reserves of commercial lumber in the country and their proper development is a problem deserving the most careful attention. Methods of conservation are needed today rather than at some future date when the timber is largely gone. The Khingan Mountains to the west and north of the Manchurian Plain have a greater area of forest than this region, but the average tree is smaller and the quality of the wood is not up to that of Kirin.

The forests of this region contain a great variety of trees. The highest elevations are usually covered by soft-wood conifers, the forests of the slopes are of mixed varieties, while in the lower elevations are found the broad-leaved hardwoods. The principal wood is Korean pine, which furnishes about 70 per cent of the timber floated down the Sungari River to the railroad at the city of Kirin. These trees frequently grow to a height of 100 ft. and have a diameter of 3 ft. at breast height. Spruce is second, amounting to 20 per cent, while other species include larch, elm, birch, oak, and fir. The cutting of trees is

handicapped by the mountainous topography and the dense undergrowth of brush. The work is generally carried on during the fall and winter when the ground is frozen and the snow makes a natural roadway. After the trees have been cut, they are hauled to the nearest streams by horses or oxen, where the logs are piled to await the melting of the frozen rivers. During the spring and summer, the logs are floated downstream to the nearest railroad. The principal lumber markets are at Kirin and Antung.



FIG. 111.—The mountains of Manchuria contain China's largest timber reserves. This is a larch forest in Kirin. (*South Manchuria Railway.*)

The most important producing area is located in the upper valley of the Sungari River 180 miles from the city of Kirin. In this district, from twenty to thirty thousand men are employed annually and the forests are being rapidly destroyed with slight regard for the future. The results of this policy have already appeared in decreased shipments during the last few years, and the forest region is now 10 to 15 miles away from the river. Next in importance are the headwaters of the Yalu.

Although large tracts near the railroads and rivers have already been cut over, a tremendous reserve of excellent timber still remains. The total amount is uncertain, but the entire reserves of northern

Manchuria have been estimated by the Chinese Eastern Railway at 70 billion cubic feet. The South Manchuria Railway, on the other hand, places the forest areas of all Manchuria at 88,799,000 acres and the volume at 149,918,000,000 cu. ft. Of these huge totals, more than half, and much the better half from the standpoint of quality, lies in the Mountains of Eastern Manchuria.

A large development is possible, both of lumber for construction purposes and of pulp for the making of paper. At present, approxi-



FIG. 112.—The log cabins used by lumbermen in Kirin are similar to those of temperate forests the world around. (*Atto Photographic Association.*)

mately one-fourth of the wood cut in the vicinity of the Chinese Eastern Railway is used for fuel. Wood is used instead of coal for most of the locomotives of this line and is generally employed for heating houses in Harbin and the other cities of northern Manchuria. Harbin alone consumes about 280,000 tons a year.

The future of the region seems clear. With careful forest control, including regulated cutting and replanting, there is no reason why the Mountains of Eastern Manchuria should not constitute a permanent source of timber for China.

Wild animals abound in the forests and are hunted or trapped for their fur during the winter. This is especially true in the more inaccessible areas among the higher mountains.

The wealth of these mountains consists not only of timber but also of minerals. The thick forests and remoteness of the region have retarded exploration, but preliminary investigations indicate that a number of mineral deposits are of large extent and of great value. Important coal mines have been developed at Mishan and Mulin near the Chinese Eastern Railway. Large deposits of high-grade iron ore have recently been found near-by but have not yet been exploited. Other deposits of coal are known to be present in the vicinity of Kirin. Gold is found in the gravels of many rivers, but the production is not so extensive as in the Khingan Mountains.

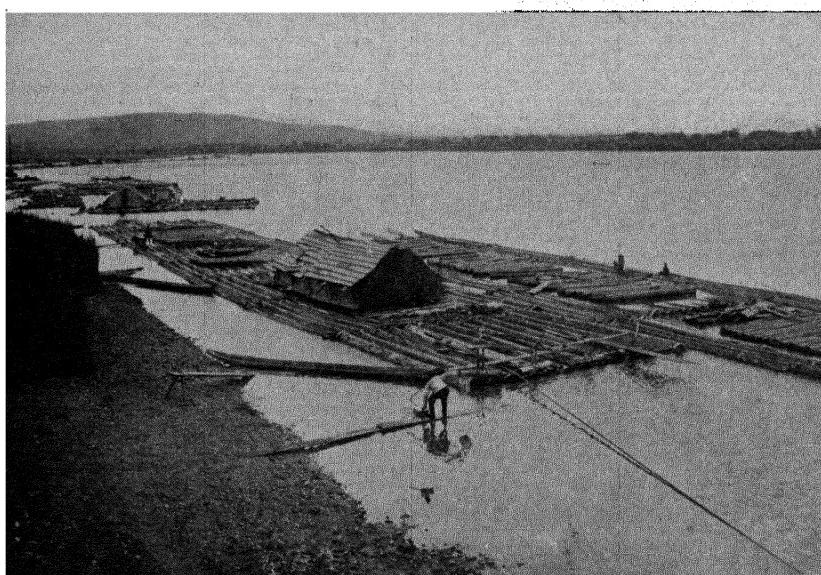


FIG. 113.—Huge rafts are floated down the Sungari to the city of Kirin from the virgin forests near the headwaters of the river. (*South Manchuria Railway.*)

CLIMATE

Climatic conditions are influenced by the altitude and the nearness to the sea. Although the continental influences which characterize the Manchurian Plain are still important, the mountains and the proximity to the ocean give this region a greater rainfall. The precipitation ranges from 1,000 mm. (40 in.) or more in the higher mountains of the east to 635 mm. (25 in.) along the borders of the plain in the west.

The winters are severely cold with considerable snow, and because of the elevation the summer temperatures are never high. Only the

three summer months of June, July, and August are free from frost, so that human activities are distinctly handicapped by climatic conditions. Winter temperatures drop to -35°C . ($-30^{\circ}\text{F}.$).

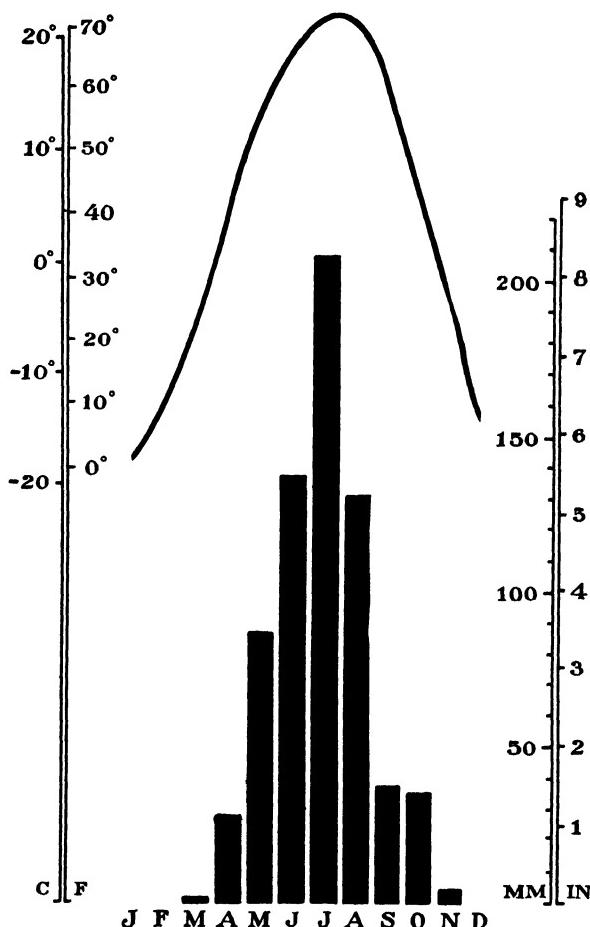


FIG. 114.—Climatic conditions in the Mountains of Eastern Manchuria, based on the record for Kirin. No precipitation data are available for January, February, and December.

Rain falls on approximately 120 days during the year and the total precipitation is higher than in most other sections of North China. The winter snows and the excellent forest cover cause the streams to be more constant than elsewhere. Hydroelectric developments may some day take advantage of this situation.

AGRICULTURE

Despite the mountainous land forms, more people are engaged in agriculture than in any other occupation. On account of the shorter growing season and the heavier rainfall, agricultural conditions are not the same as those in the Manchurian Plain. There is less chance of crop failure from drought, but quicker growing varieties of crops must be raised in order that they may mature before the early frosts of the fall. The growing season does not exceed 125 days. The chief crops are soy beans, millet, wheat, and kaoliang. Most famous of all the products is ginseng, the root of which is highly prized as a drug. This was one of the original attractions to the Chinese settlers.



FIG. 115.—Rolling countryside near the city of Kirin.

The principal agricultural development has taken place south of the main line of the Chinese Eastern Railway, especially in certain districts of the eastern part of Liaoning where the mountains are lower and broad valleys invite cultivation.

Farming is carried on under a variety of conditions according to the nature of the physiography and the ease of access to the outside world. In frontier districts, the farmer must clear the land of stumps or stones and wrestle with steep hillside slopes where the soil is rapidly washed downward to cover the fields in the valley bottoms. The only level land is in the valley bottoms along the sides of winding streams,

where it is liable to be swept away by a single summer flood. Many fields are small and ill suited to cultivation. The poorer farmer in the remote mountains has a farm with a bit of woodland, a steep hillside field or two, and a narrow ribbon of flat land in the valley bottom. He lives in a log hut with the simplest of furnishings. His tools include an ax, a home-made plow, and some bent sticks for farm tools. He will probably have an ox or a horse and some pigs or a few sheep which roam at liberty through the forest.

In such an environment, people can afford few luxuries from the outside world, for, since they produce but little which can be sold, there is no opportunity to buy. They must either make what they need or do without.

Within recent years, many immigrants from Shantung have come into the southern section. A large district which was formerly an imperial hunting ground of the Manchus has been opened to colonization and the available agricultural land is rapidly being taken up. Along the borders of Korea, hundreds of thousands of Koreans have come across into China and by their low standards of living are displacing the Chinese. They are chiefly engaged in the cultivation of rice, which is raised in flooded fields like those of Korea. This is the only example in China, and probably anywhere in the world, of a race which is able to compete with the Chinese and win out. This is only possible because of their extremely low standard of living.

CHAPTER XII

THE KHINGAN MOUNTAINS

THE GEOGRAPHIC SETTING

The Khingan Mountains have the shape of an inverted L and may be divided into two parts, the Little Khingan Mountains in the north, corresponding to the horizontal bar, and the Great Khingan in the west. The region lies between the Manchurian Plain and the Mongolian plateau and Siberia. On the north and northwest it is bounded by the Amur River, or Heilung Kiang, and its tributary the Argun, separating the Khingan Mountains from Transbaikalia and the Maritime Provinces of Siberia.

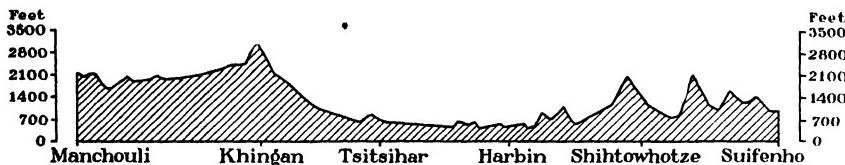


FIG. 116.—Profile across Manchuria along the Chinese Eastern Railway, showing the relation of the Mongolian plateau and the Great Khingan Mountains to the Manchurian Plain.

The Great Khingan Mountains are a long and narrow range of gneiss and granite which forms the uplifted margin of the Mongolian plateau. The Manchurian Plain is everywhere below an elevation of 1,000 ft., while Mongolia averages about 4,000 ft. As seen from the west, the Khingan consist of a series of high rounded hills, which in most districts do not rise much more than 1,000 ft. above the level of the plateau. As a result, the rolling grassland of the steppe continues almost to the crest of the range. In contrast to the insignificant development of the mountains on the Mongolian side, the eastern slopes have a relief of over 3,000 ft. with deep valleys.

The profile of the Chinese Eastern Railway (Fig. 116) across these mountains illustrates this contrast. On the eastern slopes, the railway encounters steep grades and difficult problems of engineering in rising from the Manchurian Plain, while, after emerging from the tunnel which pierces the crest of the range, the railway almost at once enters the rolling Mongolian plateau. To the south the moun-

tains become lower until they almost disappear in the latitude of the Liao Ho before reaching the mountains of Jehol. Very little is known of the northernmost portion of the Great Khingan or of its structural relation to the Little Khingan. Lava flows are reported from the vicinity of Mergen. The term Little Khingan is commonly used to denote all of the northwest-southeast range, but E. E. Ahnert prefers to limit the term to the eastern extremity of the mountains, introducing the name Il-Khuri Alin for most of the range.¹



FIG. 117.—The southern Khingan have few trees and are the grazing grounds of nomads who build stone *obo* on many of the hills to insure good fortune.

The Khingan Mountains are geologically ancient and have the smooth, rounded profiles which result from long-continued erosion. The topography is late mature, and precipitous slopes are largely absent. The highest elevations of the region are in the central portions of the Great Khingan, where a number of peaks exceed 6,000 ft., with the greatest elevation approximately 8,000 ft. Except near the margin of the region where the valleys are open, there is but little level land for cultivation. On account of the remote and uninhabited nature of the region, large areas have never been explored and there are no reliable maps. The most work has been done by Russian travelers.

The climate is more pronouncedly continental than that of either the Manchurian Plain or the Mountains of Eastern Manchuria. The

¹ AHNERT, E. E., "Practical Hints to Scientific Travellers," New York: American Geographical Society, V (1927).

position next to the desert and the greater distance from the ocean combine to give these mountains a more arid climate with a precipitation which probably nowhere exceeds 300 mm. (12 in.). The weather is cold and rigorous throughout most of the year. Less than one hundred days are free from frost and the days which might really be called hot are limited to the space of a few weeks. A little snow falls during the winter months, but the amount is less than in the other mountains of Manchuria. Owing to the dry atmosphere, it does not remain on the ground long.

TIMBER AND GOLD

The greatest resource of the Khingan Mountains is timber. Although the southern portions of the Great Khingan are only sparsely wooded, much of the region is covered with thick forest. This is especially true north of the Chinese Eastern Railway and in the Little Khingan. These forests resemble those of Siberia, where they are known as the *taiga*. The predominating species is the larch, which represents about three-fourths of all the trees. The only other varieties of importance are the birch and low-growing oak. Birch and oak are used principally as firewood, while larch supplies suitable railroad ties and construction material. Most of the trees are small, with a diameter which averages about half or two-thirds that of the trees in the Mountains of Eastern Manchuria.

The best dimensional lumber is obtained from the larch and is widely used for railway construction and mine requirements, especially where durability under unfavorable conditions is called for. Many of the trees are ill suited for sawing into boards and a large percentage of the wood is cut for firewood.

It is possible that in the future these extensive forests may be utilized for the manufacture of paper. Much of the paper now used in China is imported but might instead be made in Heilungkiang and Kirin.

The production of timber in this region has increased rapidly within recent years, although it is still much less than that of Kirin. Virgin forests are to be found only at a distance of 20 miles from the railroad and production is now handicapped by poor transportation facilities. In contrast to the mountains of Kirin, this region has few rivers suitable for the rafting of logs, and the light winter snow makes hauling difficult. In addition, the great distance from markets retards development.

The second resource of these mountains is gold, considerable quantities of which are obtained along the northern and southern

slopes of the Little Khingan. The output fluctuates widely and production is on a small-scale basis. The gold is obtained from placer deposits which are found in the tributaries of the Amur River and near Sansing on the Sungari. This region has been China's chief producer for many years and the area has been famous as the "gold-producing country." Almost the entire yield has been from stream gravels, few bedrock deposits having been found. In 1913 there were 113 mining areas in Heilungkiang. As with so many other profitable occupations, the business has been much overdone. So many would-be prospectors are engaged in a search for the yellow metal that there is scarcely enough profit for any of them. Bandits have found these gold areas a profitable field for their activities.



FIG. 118.—A beech forest in the northern Khingan. Russian influences are shown in the yoke. (*South Manchuria Railway*.)

THE HUMAN RESPONSE

The population of the region is small and scattered. There are few towns, and the chief settlements are along the railroad or rivers or at widely separated intervals in the forests. During the summer, a few tourists and sportsmen scatter through the region, while in the winter the opening of the lumber camps brings in a considerable number of workers. The western portions of the mountains are inhabited by nomadic Mongols who wander over the hillsides with their sheep and cattle in search of pasture. Primitive reindeer using Tungus live in the northwest.

Owing to the unfavorable climate, cultivation is very limited. The warm season is too short, and most sections are without sufficient rainfall. There is little land suitable for cultivation, even if it were climatically possible. There are no statistics as to the extent of agriculture.

In this region of adverse environment, it is but natural that economic progress has been retarded. The only possibility for the future lies in the development of the timber and mineral resources. This region as a whole can probably never rise very much above its present state, for its natural environment strictly limits the possibilities of human expansion.

CHAPTER XIII

THE CENTRAL ASIATIC STEPPES AND DESERTS

THE CHARACTERISTICS OF THE DESERT

Inner Asia includes a vast region of arid desert and semiarid steppe. In Mongolia and Sinkiang there are a million square miles where the rainfall averages less than fifteen inches. In this waste all of life struggles incessantly against the restrictions imposed by the climate and only those plants or animals survive which can adjust themselves to the meager resources available. The limited water supply furnishes the clue to the interpretation of drainage, vegetation, and human activity. The possibilities of occupation, shelter, food, fuel, and clothing are all laid down by nature. The one resource is an uncertain supply of short dry grass. The Mongols, in adjusting themselves to its distribution, have of necessity become shepherds, wandering from place to place with their flocks in search of pasturage.

Around the margins of this region, the rainfall is sufficient for a sparse growth of drought-resisting grasses; but in the true desert, vegetation is almost absent. This bordering zone is known as the *steppe*. Together with scattered oases fed by withering mountain streams, these are the only parts of the region which are of economic importance. The central zone of the true desert is a vast rolling plateau, characterized by a seemingly endless uniformity and graphically described by Prejevalsky, the great Russian explorer who crossed the Gobi during the middle of the nineteenth century.¹

“The population of the Gobi proper is far more scanty than in the steppe country which precedes it. Indeed, none but the Mongol and his constant companion the camel could inhabit these regions, destitute alike of water and timber, scorched by an almost tropical heat in summer, chilled in winter to an icy cold.

“The barrenness and monotony of the Gobi produce on the traveler a sense of weariness and depression. For weeks together the same objects are constantly before his eyes; cheerless plains, covered in winter with the yellowish withered grass of the pre-

¹ PREJEVALSKY, N., “Mongolia, the Tangut Country, and the Solitudes of Tibet,” 20–21.

ceding year, from time to time broken by dark rocky ridges or by smooth hills, on the summit of which the swift-footed antelope occasionally casts a light shadow. With heavy measured tread the camels advance; tens, hundreds of miles are passed, but the changeless desert remains somber and unattractive as ever. The sun sets, the dark canopy of night descends, the cloudless sky glitters with myriads of stars, and the caravan, after proceeding a little further, halts for the night. The camels show unmistakable satisfaction at being freed from their burdens, and lie down at once



FIG. 119.—Mongol horsemen of the steppe-lands near the Siberian border, where more abundant grass makes grazing attractive.

near the tents of their drivers, who busy themselves in preparing their unsavory meal. In another hour men and beasts are asleep, and all around reigns the deathlike stillness of the steppe, as though no living creature existed in it."

The greater part of Mongolia consists of flat featureless plains, floored with rock and covered with a thin veneer of sand or pebbles. Parts of this surface are remarkably peneplained, the ancient underlying formations having been so perfectly beveled that automobile travel is possible in any direction. These broad areas of nearly level country are known to the Mongols as *gobis*. Here and there are lenses of younger sediments scoured out by the wind to form broad shallow basins. Mountains or bad-land topography is the exception.

In a few areas there are wide tracts of shifting dunes. These dunes do not assume the importance in Mongolia which they do in Sinkiang, but they present, nevertheless, a problem for the traveler.

THE LOCATION

On almost all sides the Central Asiatic Steppes and Deserts are surrounded by high mountains which keep out the moist winds from the distant oceans. The average elevation of the plateau-basin is 4,000 ft., decreasing in the center to 3,000 ft.

The regional boundary is physiographic, climatic, and human. In some places it is sharply defined by high mountains, such as the Altyn Tagh and the Nan Shan; elsewhere there is a transition from the marginal steppe to the subhumid hilly country, as is the case in northern Mongolia.

The boundary next to the Loess Highlands and the Khingan Mountains has already been described and is well defined. In these sections, the undulating plateau descends abruptly to the surrounding lower land. In the vicinity of Kalgan, or Changchiakow, the traveler from the north journeys across broad plains without deep valleys or trace of mountains until, on passing through a ruined gateway of the outer Great Wall, a marvelous panorama is suddenly disclosed. Beneath his feet is a maze of rugged mountains and precipitous ravines. In a distance of 20 miles the road drops from the summit of Wanchuan Pass with an elevation of 5,042 ft. to 2,470 ft. at Kalgan. At the top of the pass, one stands on the divide between Pacific and interior drainage.

On the north, the geographic region does not extend to the political boundary of Outer Mongolia but lies near Urga, recently renamed Ulan Bator, and Uliassutai, where the flat desert changes to tree-covered mountains. In Sinkiang the region includes the Tarim Basin and Lop Nor and is sharply limited by encircling mountains of great height. Those to the south are the Altyn Tagh, while on the north lie the Tien Shan. This desert area is much less than the political limits of Sinkiang, which include large sections of mountainous country of different environmental conditions.

The chief problem in fixing the boundary of the geographic region lies in the northwestern part of the area, in the vicinity of Dzungaria. This basin opens to the west as well as to the east and has much in common with the Khirgiz Steppes of Russian Turkestan. Most of Dzungaria probably belongs with the Central Asiatic Steppes and Deserts.

The chief deserts are the Gobi occupying most of central Mongolia, the Ordos and the Alashan in western Inner Mongolia, and the Taklamakan in Sinkiang. Parts of the last, as around the salt-encrusted basin of Lop Nor, are exceedingly dry and desolate. The steppe land of the region is largely in the southern and eastern parts of Mongolia and the northern portions of the Tarim Basin. Chinese colonists are rapidly spreading over the semiarable land of southern Mongolia and pushing back the nomads. Aside from these areas, the fixed population is confined to stream-fed oases or monasteries.

CLIMATIC CONDITIONS

Central Asia has some of the greatest climatic extremes in the world. Owing to its vast size and the distance of the interior from the moderating influences of the ocean, there is a pronounced contrast between summer and winter. The dryness of the air over the desert permits a large proportion of the sun's heat to penetrate to the surface, and during the brief summer the bare earth becomes very hot. Rock surfaces exposed to the sun may have a temperature of 65°C. (150°F.), or above, during the middle of the day and the air itself may be 38°C. (100°F.). During the winter this transparent nature of the atmosphere permits radiation to cool the earth excessively so that the weather becomes bitterly cold, with temperatures down to -40°C. (-40°F.). Descending air currents also bring cold air from the upper atmosphere.

During the summer the sun rises in a cloudless sky and the air almost at once becomes hot. The yellow sand and bare rock reflect the glare and by noon the air is dancing with a quivering mirage. Fortunately, the air is dry so that the heat is bearable. By late afternoon cumulus clouds develop but seldom yield rain. As day arrived quickly, so of a sudden night covers everything and the stars sparkle with unusual luster in a chilly sky. In the early and late summer such days may be interrupted by others which are icy cold with flurries of snow and bitter winds.

This region has two seasons rather than four. Winter may be said to last for eight months and is abruptly followed by a short, hot summer. Frosts occur early in September and the few streams are frozen by October.

At all seasons the winds blow strongly and lift clouds of dust and silt into the air, often giving it a yellow haze which persists for days. It is these winds which have denuded the region of any original cover of soil and have transported the fine material to the loess regions south of the Great Wall.

The rainfall of the Central Asiatic Steppes and Deserts usually comes as a gentle drizzle, seldom having the nature of convectional cloudbursts such as characterize subtropical deserts. Much of the precipitation appears to be related to the weak cyclonic storms which

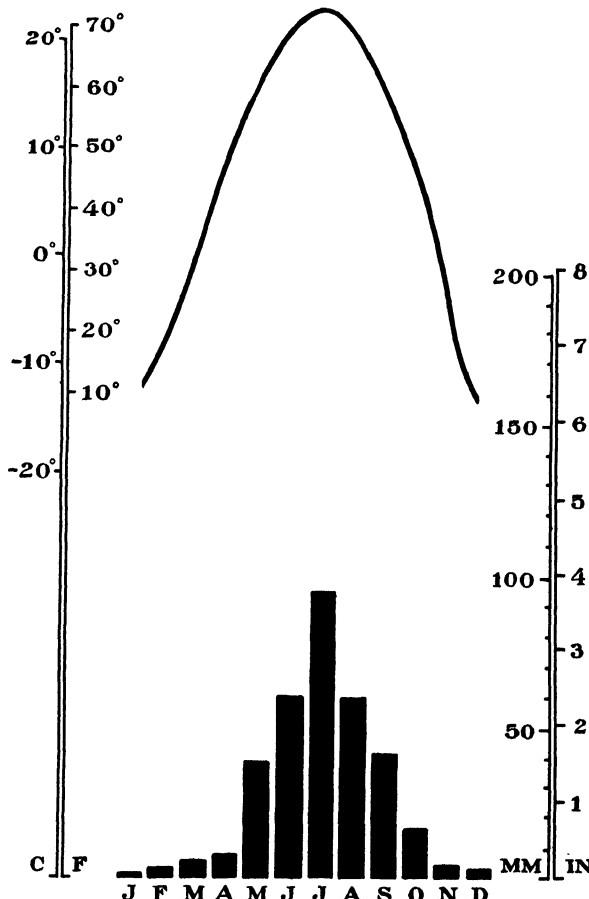


FIG. 120.—Climatic conditions in Inner Mongolia, based on records for Siwantse (338 mm.) and Erhshihsekengti (335 mm.).

cross from Europe. In the steppe lands of the south and east the precipitation averages about 300 mm. (12 in.), but for most of the region the figure is about 200 mm. (8 in.) or less. The central portions of the Takla Makan are practically rainless. Almost the entire precipitation falls during the summer. The winters are dry and the snow forms only a thin cover, except where it is drifted in depressions or behind projecting rocks.

Throughout the whole region the rainfall is subject to great variations from year to year and from place to place. Basins may be filled with small transient lakes which remain a few weeks or months after a rain and then not be filled again for years.

The air is dry and the region characteristically has a parched and burnt appearance. Evaporation takes place rapidly and a few hours after a rain the surface of the ground may appear as dry as before. The few streams which come down from the mountains soon dry up or disappear in the sands. In humid parts of the world all depressions are filled to overflowing with fresh-water lakes. In the desert, many shallow basins are dry or partially filled with salt lakes which change in size according to the variations of rainfall and evaporation. Many of these lakes dry up, leaving behind only a mud-cracked playa with its central surface whitened by a salt or alkali crust.

One of the most serious problems of life in the desert is the scarcity of water. There are almost no dependable rivers, and springs are few and unreliable. Water is commonly obtained from wells which range in depth from a few feet in the lower depressions to a hundred feet or more on the level plains. Most wells are revetted with stones or sticks. These wells are usually spaced about a day's journey apart along the various trails and are the centers for watering the flocks of the district.

LIFE DEPENDS ON GRASS

The key to an understanding of the desert is water. Without it the landscape is empty and devoid of life; with water the desert becomes a beautiful land of grass and flowers. The empty desert has a fascination in its solitude and rock sculpture and color, but it is not a place where one can live. Fixed settlement is restricted to those areas where the rainfall is sufficient for a little vegetation, or where water may be obtained from wells or springs or mountain streams. Where this is possible, small communities may arise, as isolated from the outside world as islands in the ocean. Such oases form the stopping points along the caravan trails which cross the desert. Often the wells are too small or the water too poor to permit of settlement. In such cases there may be no signs to guide the traveler, and a good memory and keen sense of direction are needed to locate the water holes.

In the central portions of the region the annual rainfall is less than 200 mm. (8 in.), while in the driest places the precipitation is even less. Under such conditions vegetation is practically absent. Around the margins of the true desert and on the slopes of some mountains, the rainfall is slightly higher and scattered clumps of grass and xerophytic plants appear. This grass does not cover the ground but rather grows

in isolated tufts separated by bare soil. Only where the rainfall exceeds 300 mm. (12 in.) is there a continuous cover of short grass. This steppe land is the true home of the nomad and his flocks. Even here the vegetation is not abundant and if the rain is slightly below normal the pasturage fails.

Life in the steppe is completely dependent upon grass, which in turn rests upon the rainfall. Agriculture is almost out of the question, and for most of the region the only feasible occupation lies in the keeping of animals. These sheep, horses, camels, and cattle live on the short steppe grass and form the sole support of the nomads.



FIG. 121.—Sheep and cattle convert grass into products useful to man. The remnants of a transitory playa lake may be seen at the right. (*American Museum of Natural History*.)

From them they secure the milk, butter, and cheese which form so large a part of their diet. Clothing and shelter are both made from the wool of the sheep, while the other animals provide the only modes of transportation. In the absence of wood, even the fuel consists of the dried dung of the animals, known in Mongolian as *argol*, great piles of which are to be seen about every encampment. All life centers in the quest for grass. When it fails, life fails; when it is abundant, prosperity rules. Since the grass is too short to be cut, there is no possibility of storage. The people of the grasslands are thus nomads, constantly on the move in search of pastures.

The following description from Abbé Huc, who traveled through Inner Mongolia in 1844, graphically portrays this wandering life:¹

¹ HUC, E. R., "Travels in Tartary, Thibet and China," I, 48-49.

"You sometimes in Tartary come upon plains more animated than those you have just traversed; they are those whither the greater supply of water and the choicest pasture have attracted for a time a number of nomadic families. There you see rising in all directions tents of various dimensions, looking like balloons newly inflated and just about to take their flight into the air. Children, with a sort of hod at their backs, run about collecting



FIG. 122.—The collection of *argol* or cattle dung is left to the women and children. Around many encampments, piles of this fuel bulk larger than the yurts themselves. (American Museum of Natural History.)

argols, which they pile up in heaps around their respective tents. The matrons look after the calves, make tea in the open air, or prepare milk in various ways; the men, mounted on fiery horses, armed with a long pole, gallop about, guiding to the best pastures the great herds of cattle which undulate, in the distance all around, like the waves of the sea.

"All of a sudden these pictures, so full of animation, disappear, and you see nothing of what of late was so full of life. Men, tents, herds, all have vanished in the twinkling of an eye. You merely see in the desert heaps of embers, half-extinguished fires, and a few bones, of which birds of prey are disputing possession. Such are the sole vestiges which announce that a Mongol tribe has just passed that way. If you ask the reason of these abrupt migrations, it is simply this—the animals having devoured all the grass that grew in the vicinity, the chief has given the signal for departure; and all the shepherds, folding their tents, have driven their herds before them, no matter whither, in search of fresh fields and pastures new."

Enveloped in aridity, the Mongols have adjusted themselves to a pastoral existence wherein the whole economy of life centers around grass, the sole resource of the desert. It is not strange that the greeting among the Mongols is usually, "Is the pasturage with you rich and abundant?" or, "Has rain fallen in your neighborhood?"

THE MONGOLS, SHEPHERDS OF THE STEPPE

Central Asia is the home of those who dwell in tents and are ever on the move with their flocks in search of pasturage. These nomads are not the most important group of the entire population numerically, but they form the most interesting example of the adjustment of life to a peculiar environment.

The people who live in fixed habitations are confined to oases or lamaseries, located along the caravan routes or in the few more favored districts where agricultural occupation is possible. These city folk and farmers constitute more than half the total population, but the area which they occupy is quite insignificant.

In the eastern two-thirds of the region, the nomads are Mongols and the city dwellers Chinese, while in Sinkiang the inhabitants are largely Turkomans, many of whom cultivate oases fed by streams which come out from the snow-clad mountains which encircle the desert. There are no census figures and all estimates are approximate. The total population of the region is probably about 5,000,000, of whom 3,500,000 live in Sinkiang.

The nomadic life of the herdsmen calls for a dwelling which can be made of local products, is easily transported, and affords sufficient protection from the bitter climate of the winter. The result is the felt-covered tent, or *yurt*, 12 to 15 ft. in diameter and seldom much higher than a man's head. This structure consists of a collapsible framework of

willow sticks brought from some distant stream side, over which are placed layers of thick felt made of sheep's wool. A low wooden door affords access at one side and one of the felts on the top may be thrown back to let out the smoke of the *argol* fire. There are no windows, and in many yurts there is not room to stand. During the winter the opening in the roof is closed so that the interior is filled with acrid smoke. The only furnishings consist of a chest or two and a low table, a few rugs or skins, and simple cooking equipment. The felts are white when new, but the smoke and grease soon discolor them and make them quite impervious to rain or wind. During the summer months, the felts are sometimes replaced by reed mats.



FIG. 123.—The yurt is made of a collapsible framework of willow sticks covered with layers of thick felts. The low door provides the only light and ventilation. (*American Museum of Natural History.*)

The food of the nomads is of the simplest sort. No cultivation whatever is carried on by the typical nomad, but a little barley, millet, and wheat flour are bought from passing caravans or from the inhabitants of scattered oases. The chief food is derived from the animals and consists of milk, butter, cheese, and mutton. On account of the scarcity of water, the utensils are seldom washed. As a result, the milk quickly becomes sour. This milk forms a part of the staple drink of the Mongols, which is made from sour milk, brick tea, butter, and salt.

The visitor to a Mongol yurt has an interesting experience before him. Upon entering the door, which is so low that he must stoop to avoid bumping his head, he should be careful to sit on the right of the fire, which occupies the center of the room. After a few moments of conversation, a servant will bring in steaming bowls of Mongolian tea, if a beverage so variously concocted may still be called "tea." Since earthenware vessels would easily be broken in the course of shifting camp, the bowls are made of wood. This is fortunate, for the tea is very hot. If the traveler is a Mongolian himself, he will doubtless produce his own bowl from the folds of his garments, for every one carries his own. In case the tea brought in by the servant is without



FIG. 124.—The interior of a yurt, with wooden pot for tea, brazier for *argol* fire, and chests for extra clothing. The boys hold wooden bowls used for the hot tea. Straw mats and rugs cover the floor. (*American Museum of Natural History*.)

butter, the host will produce a large ball of questionable age and none too attractive appearance and with his unwashed hands squeeze off a generous portion for his guest's bowl and for his own. Parched barley or millet, or small lumps of musty cheese may then be added and the whole concoction is stirred with the finger to form a gruel. In justice to the Mongolian and his "tea," it must be said this drink is really not so bad as it may sound, and it does provide warmth and energy. When finished, the guest should not forget to lick out his bowl with his tongue. These wooden bowls are made of just such a size and

shape that the tongue can neatly clean them out, for water is too scarce to be wasted in washing.

The Mongols are wonderful horsemen and practically live on horse-back. So true is this latter fact that many of them are bow-legged. To protect themselves from the cold winds, sheepskins and felts are widely used. The boots are of leather or thick felt and very stiff, so that they are ill adapted to walking. As a result, the Mongols never go on

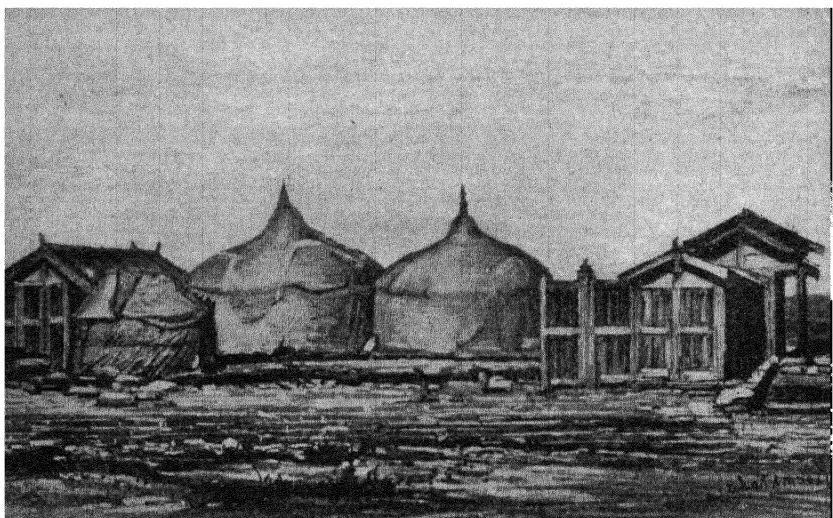


FIG. 125.—In the yurt at the left lies the casket of Genghis Khan, emperor of the largest land empire in all history. This is at Edchin Koro in the Ordos Desert. (*After Potanin.*)

foot when they can ride. Their step is heavy and awkward and their bodies bend forward as in the saddle. The horses are small wiry animals and are capable of remarkable speed. The writer was at one time riding in an automobile at about twenty-five miles an hour, which was all that was safe over the roadless desert, when a horseman came up and kept pace with the car without effort and with apparently more comfort than the occupants of the automobile.

The sight of Mongol riders in pursuit of an untamed horse is one not soon to be forgotten. They stand in the stirrups and, despite the irregularity of the land, seemingly fly over the surface. Each horseman is provided with a long pole, at the end of which is a loop of rope. When they approach the animal, they take the bridle of their horse in their mouths and seize the pole with both hands. With a quick and skillful motion, the loop is then thrown around the wild horse's neck and he

is dragged to the ground. Since all this takes place while racing at top speed across the plain, it calls for superb horsemanship and skill. The poles or ropes may sometimes break, but such a thing as a rider being thrown from his horse is unheard of.

The Mongolians are capable of sudden bursts of energy but tend on the whole to be lazy. When wolves carry away the sheep or when plundering nomads attack their tents, they spring into activity and



FIG. 126.—The great Lama temple at Urga. Tibetan architecture characterizes the walls, but the roof is Chinese. (*American Museum of Natural History*.)

may ride for hours or even days without rest. On their return to their yurt, they lie down in the corner and sleep for a day or two. The daily work of milking the cattle and preparing the food is all attended to by the women.

This normal stolidness, interrupted by brief periods of intense activity, is a miniature picture of the history of the region. During most of the last twenty centuries, Central Asia has played an insignificant part in the world's history. At certain times, however, the nomads have spread out into the agricultural lands of China and Europe and built up great kingdoms. Under Genghis Khan and his grandson Kublai, the Mongolians established the greatest continuous

land empire the world has ever seen. At its height this extended from Indo-China to the shores of the Baltic. When it is recalled that it was tied together by couriers on horseback rather than by railroad and telegraph, the military and organizing ability of its rulers is even more remarkable.



FIG. 127.—This Lama priest is returning from a two years' pilgrimage in Tibet where he copied sacred writings for the library of his monastery. The box at his side contains Buddhist images while the pack on his back has all his worldly goods.

No picture of Mongol life is complete without some consideration of Lamaism. This variety of Buddhism, of Tibetan origin, holds absolute domination over the peoples of Mongolia. At least one son from each family, commonly the eldest, must become a Lama, often being sent to the monastery while yet a child. The number of Lamas, where known, thus constitutes one of the best indices of the total population. The monasteries, which are the only points of fixed settle-

ments among the Mongols, range in size from those which have but a score of Lamas to the largest which may list over a thousand monks.

The Lama temples are substantial structures, commonly built in a mixture of Tibetan and Chinese architecture with massive white walls



FIG. 128.—The women of each tribe or banner have their distinctive headdress, gaily ornamented with silver, turquoise, and coral. These women are in Urga. (*American Museum of Natural History.*)

and gilded roof. Many of them rise from two to four stories in height. elaborately decorated both within and without. These temples not only are the centers of religious exercises but are the seats of learning as well. In the more important monasteries are usually a few Lamas who spend part of their time as artisans making brass ware or other objects. While these and other auxiliary occupations are found in numerous instances, most of the Lamas live an idle and degenerate life, their sole occupation being the protracted incantations connected with their faith. Many Lamaseries are the centers of great wealth, for they own extensive flocks and receive rich presents from those desirous of merit or spiritual assistance.

While Lamaism results in the withdrawal of a considerable proportion of the able-bodied men from productive work, it does serve as a more or less effective check on population increase, for the Lamas, in theory at least, are celibate. If the population were not thus kept within bounds, it would soon exceed the limited food-producing capacity of the land. Thus even in their religion the Mongols have made adjustments, unconsciously perhaps, to the restrictions imposed by their environment.

The wealth of the nomad is estimated by the size of his flocks and the jewelry of his wife. The land is all held by the clan or banner and there are no banks or other means of investing one's earnings. Where one moves his tent every few weeks, furnishings must be kept at a minimum and there is no inducement to purchase bulky articles. Sheep, cattle, camels, and horses are the units of trade and prosperity, and they transport themselves. When a Mongol girl is married, she is given elaborate necklaces, earrings, and hair ornaments of silver, turquoise, and coral, and these are added to from time to time. These may have cost several dozen or even a hundred animals.

The desert is a strict parent. Centuries of empirical living in these exacting wastes have produced a race of vigorous men and women to whom the hardships of heat and cold, hunger and privation, and long hours on horseback or camel back are but the commonplaces of life. Nature has long ago weeded out the unfit.

TRADE ROUTES

The Central Asiatic Steppes and Deserts extend more than 2,000 miles from the Great Khingan Mountains to the Pamirs, with a width of 300 to 600 miles. Railroads scarcely touch the borders and transportation depends on caravans, which slowly wend their way along the ancient routes connecting the chief trade centers. The vastness of the region may be realized when it is described in terms of travel. The normal time required for a journey from Kashgar (Shufu) in the extreme west to Paotow at the end of the Peiping-Suiyuan Railway is at least 125 days; and if the journey be continued by caravan to Hailar (Hulun) in the northeastern corner of the region, an additional 50 days will be needed. In place of stating its size in terms of distances, this region should be described as one which is six months from east to west and one month or more from north to south. Postal couriers riding day and night do much better than this, but for the ordinary traveler with baggage, travel is exceedingly slow and wearisome.

Horses, mules, and oxen are all used in the steppe lands and along the better watered desert roads. Carts are likewise employed. For the more arid and difficult desert trails, only camels will do. The camels of Central Asia are the two-humped bactrian variety rather than the one-humped dromedary of Arabia and the Sahara. The camel has well been called the ship of the desert, and one riding on its elevated back experiences all the roll of a vessel at sea as the stately animal methodically plods onward. The broad and cushioned feet of the

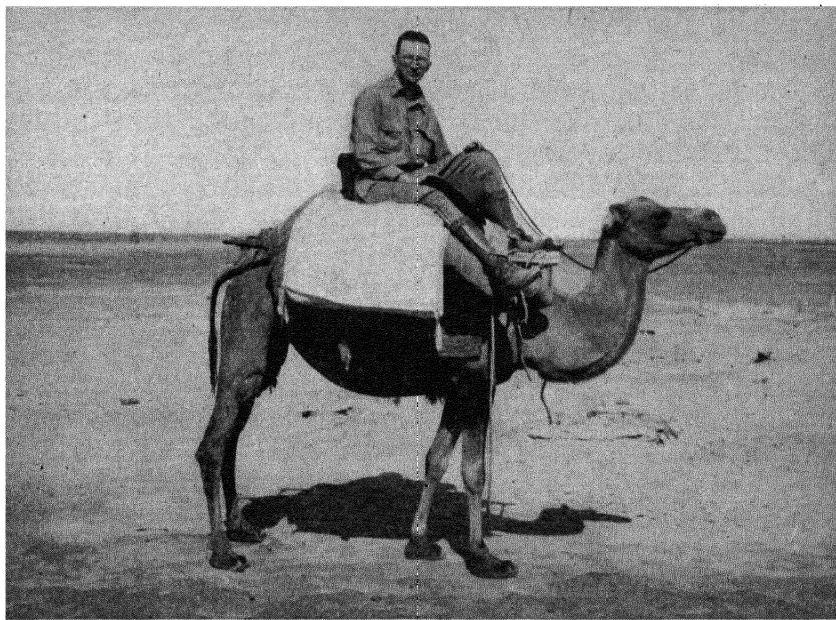


FIG. 129.—The author aboard a "ship of the desert" in the northern Ordos.

camel are well adapted to the soft sand, and the ability to go without water for many days is well-known. The humps of the camel consist of fat. When the animal is in good health, these are filled and stand upright. When the animal is tired, these humps become flabby and fall to one side. Prospective purchasers should remove the saddle pads and give attention to the conditions of the humps, and likewise to the thigh.

Most maps of Mongolia are filled with names of cities which do not exist. It seems as if map makers have disliked to leave so large an area blank and, combing the records of travelers, have supplied the maps with a generous sprinkling of names. Many of these are names of valleys or grazing grounds, while others are merely wells or unim-

portant monasteries. The only cities lie around the margins of the desert. At one time the writer visited a prominently indicated place, represented on the map in the type used for sizable towns and found that it was merely a telegraph station with one man, his wife, and a single child. On another occasion several days were spent in searching for a city shown prominently on the best maps which turned out to have been destroyed by Genghis Khan seven centuries ago.

Wells are found along the caravan routes and in the grazing grounds. These sources of water are as important to the thirsty traveler as islands in the ocean to the modern voyager by aeroplane. These wells form "stepping stones" and are scattered throughout the region. Resourceful caravan leaders are able to find their way from one oasis to another by a variety of routes unknown to the marauding brigands of the borderlands.

A list of the caravan routes is but a list of the principal cities, all connected by some sort of trail. Along the southern border of Mongolia are three cities, just outside this geographic region, which form the chief trade centers for commerce with China and the outside world. They are Kalgan, Kweihwacheng with its twin political city of Suiyuan, and Paotowchen. Each of these is located on the Peiping-Suiyuan Railway and is the starting point for important caravan routes into the desert. From Kalgan several routes lead northwest to Urga and continue farther north to the Siberian border at Kiakhta. One of these routes follows the telegraph line to Europe and is used by automobiles. Before the construction of the Trans-Siberian Railway, another trail was the route of the great tea shipments to Russia. Kweihwa has long been a center for traffic to the north and west, while Paotow, at the present railhead, is the terminus for a considerable trade with western Kansu and Sinkiang.

Five complementary centers are found north of the desert. Manchouli and Hailar, on the Chinese Eastern Railway, form the first two of these and are collecting points for wool and furs. The chief political and religious center of Mongolia is Urga, now Ulan Bator, the capital of the present soviet government of Outer Mongolia, and the residence of the third most important Living Buddha in Lamaism. Two cities of lesser importance in the northwest are Uliassutai and Kobdo. Caravan routes connect each of these centers with each other and with the cities of the south. The distance from Kalgan to Urga by the direct automobile road is 675 miles, which is covered by automobiles in three or four days. Camel caravans, which carry most of the trade, require from 30 to 45 days for the journey. Oxcarts are sometimes used during the winter.

Along the southwestern margin of the region near the base of the Nan Shan runs the great highway of Central Asia, over which have passed people, goods, and ideas since the dawn of history. Buddhism came from India to China over this roundabout way and Chinese culture penetrated westward over the same road. This historic route was followed by Marco Polo in 1275 and will some day form the path of a railway and aeroplane line to Europe. A portion of this Central Asiatic highway has already been described in the chapter on the Loess Highlands. From Lanchow in the province of Kansu it skirts the edge

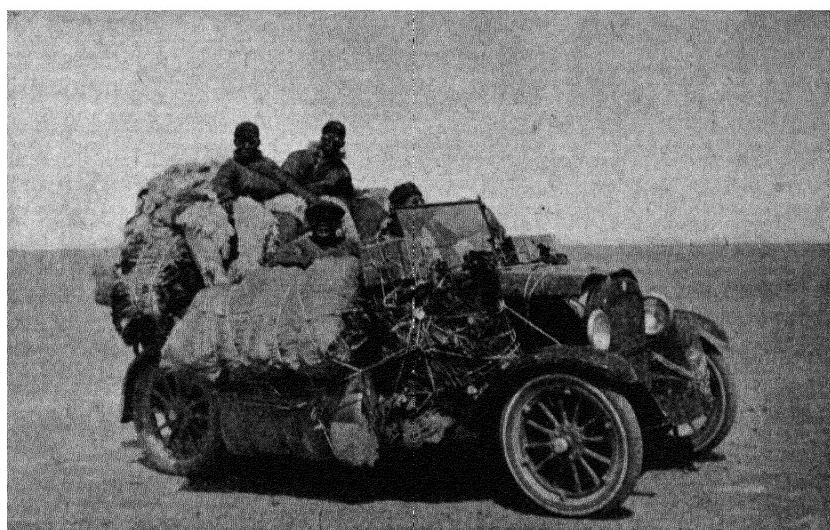


FIG. 130.—Automobile travel between Kalgan and Urga. The author once drove a touring car such as this loaded with a ton of furs and seven passengers. (*American Museum of Natural History.*)

of the Nan Shan through Liangchow, Kanchow, and Suchow to Ansi-chow, passing from one to another of the fertile oases along the foot of the mountains. Ansi marks the last of these and the trail strikes out across the barren desert for a dozen stages to the highly cultivated and beautiful oasis of Hami.

At Hami, near the extremity of the Tien Shan Range, the road divides: one part, known as the Nan Lu, or "South Road," continues to the south of the mountains, while the other, or Pei Lu, that is, "North Road," follows the other side of the range. The former passes through Karashar and Aksu to Kashgar, the metropolis of Sinkiang, while the other touches Kuchengtze (Kitai) and Urumtsi (Tihwa), and reaches the Ili Valley at Kuldja.

Other trails lead to Sinkiang from Paotow by way of the Alashan Desert, either joining the main highway at Liangchow or continuing through the desert to Hami.

There are no trails across the Taklamakan Desert in Sinkiang, and the central portion has been only partly explored. The southern margin is marked by sand-buried cities, now desolate but formerly the site of extensive settlements which were connected by a road from Yarkand through Khotan to Ansichow.

THE POLITICAL BACKGROUND

The deserts of Inner Asia are divided into two political areas: Sinkiang, often called Chinese Turkestan, and Mongolia. Since 1878 the former has been equal in status to the original eighteen provinces. Owing to its remote location, the control of the central government has been merely nominal and the actual administration has been in the hands of semi-independent governors.

Mongolia has always been rather loosely connected with China. The portion lying next to the Great Wall is known as Inner Mongolia and has for many years been subdivided into five parts. The eastern section lies beyond the Great Khingan Mountains and is really in Manchuria. Although named on some maps as the Eastern Gobi, it is in no sense a desert and now forms part of the province of Liaoning. The remainder of Inner Mongolia has been divided into the provinces of Jehol, Chahar, Suiyuan, and Ningsia. These districts also include those parts of Hopei and Shansi outside the Great Wall. For some years these four areas were known as "special administrative districts," but in 1928 they were made into full provinces.

The remainder of Mongolia, lying next to the Siberian border and comprising most of the Gobi Desert is known as Outer Mongolia. In 1924 Outer Mongolia declared her independence and there is no actual Chinese control at present. For all practical purposes Outer Mongolia is a protectorate of Soviet Russia with boundaries which are closed to Chinese authority.

AGRICULTURAL POSSIBILITIES

The boundary zone between the agricultural Chinese and the pastoral Mongols has never remained fixed. With vicissitudes of climate and the varying strength or weakness of one people or another, it has repeatedly shifted to the north or south. The present advance of the Chinese farmer is but another of these movements, destined perhaps to be more permanent because of scientific agriculture, but

none the less directly dependent upon climate and soil. The absolute desertward limit of agriculture will depend upon varying factors of economics, agriculture, climate, soil, standards of living, and government. Since these are variables, settlement in these marginal pioneer lands will inevitably be attended with uncertainty.

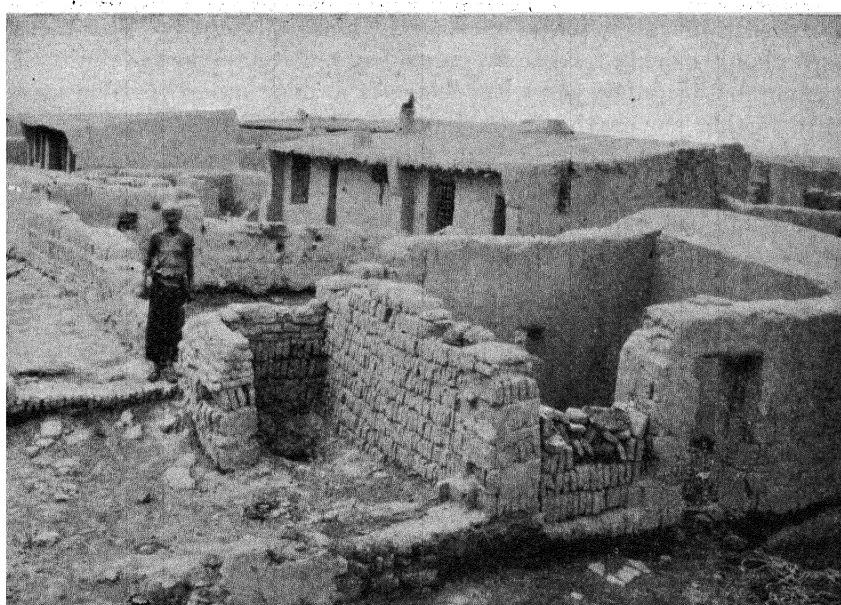


FIG. 131.—Abandoned mud houses of Chinese colonists vividly portray the recurring tragedy of marginal agriculture during dry years.

Climatic conditions are not favorable to agriculture. The winters are long and bitterly cold, while the summers are too short. Along the Great Wall the rainfall averages but 15 in. and decreases toward the desert. Spring rains are light and often fall so late that plowing cannot be started in time for crops to mature before the early autumn frosts. The growing season is seldom more than one hundred days long. In the drier areas, fields are allowed to lie fallow every other season in order to conserve soil moisture.

The soils generally belong to the gray-earth group of the pedocals and unfortunately do not retain their fertility for more than six or eight years. In some areas evaporation salts accumulate to excess and render the soil unfit for cultivation. As in all semiarid lands, irrigation tends to increase the surface concentration of these salts, which can be removed only by subdrainage or by flushing the soil with excessive quantities of water; both of these processes are difficult and expensive.

Despite these handicaps, an extensive colonization is in progress. Large areas of the steppe have been plowed up and sown to millet, oats, barley, wheat, or kaoliang. Since the fields are large, even a small yield per mow means a good income. During good seasons many districts raise twice as much food as they consume, so that they are able to tide themselves over an unfavorable year or two. Such relative prosperity, however, serves to draw in more farmers, so that these borderlands quickly tend to become overpopulated. When the rainfall is favorable for a few years, the fringe of agriculture advances northward farther and farther toward the absolute desert. Then a period of dry years ensues and one crop failure follows another so that the pioneers are forced to retreat in defeat. Unfortunately, the better farm lands behind this advancing fringe are also adversely affected by a time of drought, so they have no surplus of food for the retreating pioneers and acute distress follows.

The cultivation of these desert borderlands has its dangers not alone in the risk of famine but in the increased work of erosion. During the past thirty years, many sections where the grasslands have been plowed up have been converted into barren wastes of sand. Where the grass cover is undisturbed, it forms a protecting blanket which holds the soil in place. When this defense is removed, the wind attacks the surface and soon blows away the finer soil, eventually leaving only the coarse sand and stones. The Chinese have often spoken derisively of the Mongols because they do not till the ground. It may be, however, that the supposedly stupid nomads have known better and have realized that the only way to preserve the soil was to refrain from breaking the sod.

In Sinkiang the Central Asiatic Steppes and Deserts are surrounded by high snow-clad mountains. A number of streams come out from these mountains, especially along the northern margin of the basin, and irrigation canals lead the water from these rivers at the point where they leave the mountains and conduct it to the numerous oases, which form areas of green in an otherwise brown landscape. The area under cultivation in Sinkiang as reported by the Directorate of Statistics in 1932 amounts to 13,692,000 mow (2,282,000 acres), most of which depends upon irrigation. The fields of Sinkiang produce a great variety of products, including wheat, kaoliang, millet, beans, rice, excellent fruit, tobacco, cotton, and even silk.

So much misconception exists with regard to the possibilities of colonization in China's northwest that it is well to be quite specific. The agricultural possibilities of the Central Asiatic Steppes and Deserts in no way resemble those of the Manchurian Plain. Conditions

of rainfall, temperature, and soil are far less favorable and are dangerously near the safe limit even in the best sections. Simply to point to the great empty spaces of Mongolia and Sinkiang, and likewise of Tibet, and say that here is a possible home for millions from the over-crowded coastal plains of China, as some have done, is to fall into a profound error. The best that irrigation and scientific agriculture can do can never touch more than a small fraction of the arid lands of Central Asia. Engineering skill may eventually provide room for a few millions, but compared with the entire population of China such figures mean little. Most of the region must forever remain a desert.

CHAPTER XIV

THE CENTRAL MOUNTAIN BELT

A TRANSITIONAL REGION

The Central Mountain Belt forms a mighty mountain barrier thrust out from the plateau of Tibet almost to the Pacific, constituting part of the great Kun Lun system. It cuts directly across central China and marks the transition between the North and the South, separating the country into two diverse parts with sharply contrasting geographic conditions.

This region is a dividing zone of great significance. It is both the cause of the contrast and at the same time the boundary between the desert-influenced North and the subtropical South. Its two margins exhibit a marked change in climate, for in South China the rainfall is nearly twice that of the North and extremely cold winters are unknown. Almost as soon as one crosses the northern boundary of the region the barren landscape of the North changes to that of the green and tree-clad mountains of South China. This northern edge of the Central Mountain Belt is essentially the boundary of the loess, millet, and kaoliang of the North and the rice, tea, mulberry, and bamboo of the South, for the mountains form a great barrier which effectively limits both the moist southeast summer monsoon and the dry cold desert winds of the winter.

These mountains separate the wheat-eating people of the North who cultivate dry plains and loess uplands and who use horses, mules, and camels for transport, from the rice-eating population of the South where water buffaloes are employed to plow the humid alluvial valleys and where coolies are used for transport. Conditions of life are therefore pronouncedly different and even the language changes from the uniform Mandarin or *kuan hua* to a multitude of dialects, or at least to southern Mandarin. To appreciate the contrast which this region produces, one has only to note the difference between conditions outside its northern and southern borders. Thus, such cities as Sian and Wanhsien, Kaifeng and Hankow, and Suchow and Wuhu represent distinctly different economic and social environments. No other natural region in China separates districts with such pronounced contrasts in conditions of life.

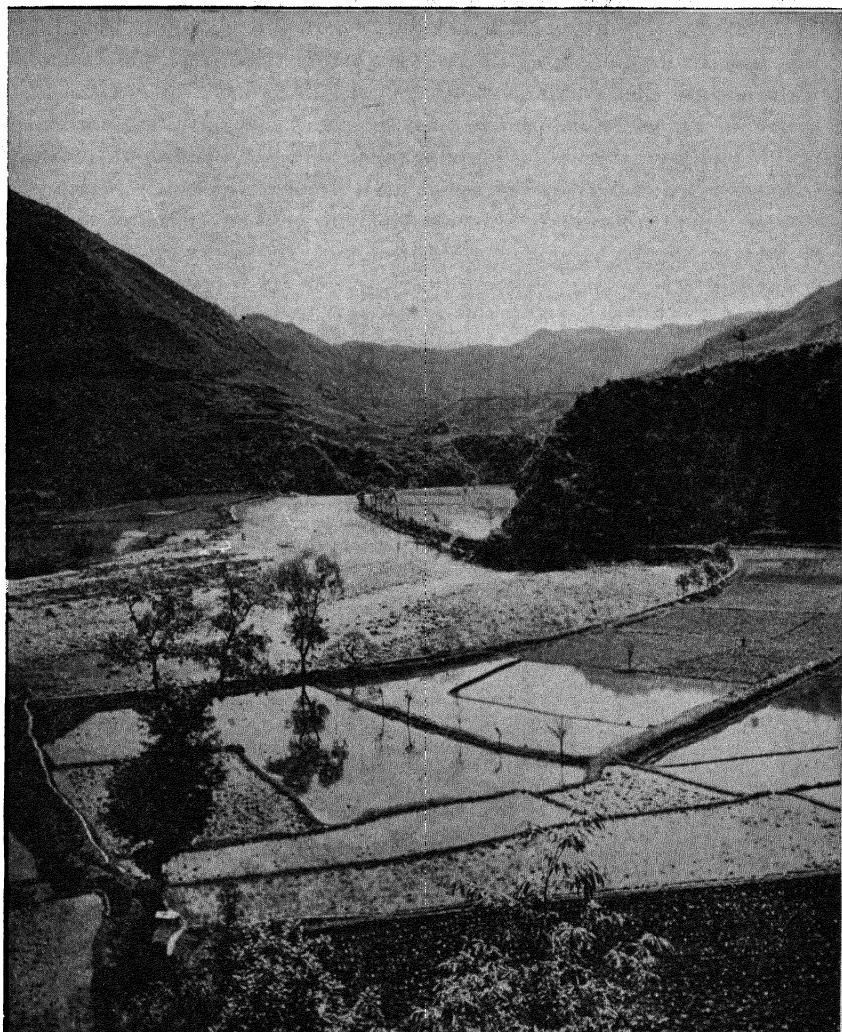


FIG. 132.—The Central Mountain Belt is the northern limit of dominant rice culture. The verdure-clad hills reveal the humid climate. (*Bailey Willis, courtesy Carnegie Institution.*)

The Central Mountain Belt not only forms a geographic boundary today, but throughout much of geologic history this region has served to differentiate the North from the South. The record of ancient life as revealed by the fossils buried within the rocks of China indicate that this has been a dividing line for millions of years with contrasting conditions of climate, physiography, and life on its opposite margins.

These mountains have likewise been of political significance, for they form a barrier to armies and rebellions. In 1860 they prevented the Taiping rebels from coming north of the Yangtze Valley and in 1875 they similarly limited the southward advance of the terrible Mohammedan uprising in the northwest.

The chief geographic importance of the Central Mountain Belt lies not so much in its own characteristics as in the more distinctive function of the region as a barrier between Northern and Southern China.

THE PHYSICAL LANDSCAPE

The Central Mountain Belt is not entirely a topographic unit. In the west the mountains are alpine in character and pass without break into the high ranges of the Tibetan Borderland, while in the east the elevations become lower and lower and the mountains grade into hills which disappear beneath the delta plains of the Yangtze Kiang and Hwai Ho. The region may thus be divided into two sub-regions: one the high and precipitous mountains of the west, and the other the much lower and more rounded elevations of the east. The division between these two districts is along the valley of the Han Kiang in the vicinity of Anlu. Although there is a marked contrast in the appearance and cultural utilization of these two sections, all parts of the Central Mountain Belt have a distinctly transitional function and are sharply set off from the adjoining regions.

The western subregion comprises about two-thirds of the total area and for the most part is a complex of ramifying ranges and deep gorges. Only a few of the valley bottoms are wide enough for agricultural development, and the level land probably does not exceed 5 per cent of the total area. It is one of the most sparsely populated and least known parts of the eighteen provinces.

The mountains of this section are known by a variety of names, many of them of local origin and application. This is often the case in China where people dwelling on opposite sides of the same range may know it by different names. The range lying directly south of the Loess Highlands and north of the Han Kiang is the Tsingling Shan,

and the mountains south of the Han Valley are the Tapa Shan, often known as the Kiutiao Shan or Kiulung Shan.

The Tsingling are the greatest mountains of China outside the Tibetan plateau. They form a high and rugged barrier extending from Kansu to Honan. In the west where they join the Min Shan, the elevations rise to 20,000 ft., while south of Sian the peaks are 10,000 to 12,000 ft. in elevation. The heart of the range is a wild unexplored



FIG. 133.—The central Tsingling Mountains south of Sian rise to heights of over 10,000 ft. (*Bailey Willis, courtesy Carnegie Institution.*)

country, characterized by rounded summits with deep impassable gorges. The Tsingling consists of a series of parallel ridges, all trending a little south of east; and a maze of ramifying valleys whose canyon walls often rise sheer to a height of 1,000 ft. above the stream.

The valley of the Han Kiang cuts this western portion of the Central Mountain Belt into two parts and provides the chief east and west highway of the region. The Han is the longest tributary of the Yangtze and throughout most of its course the river is bordered by steep hillsides which in many places narrow to form precipitous cliffs. In the vicinity of Hanchung the valley widens and there is a fertile plain some 60 miles in length with a width of not over 12 miles.

Shan, a name which is derived from their location between the Hwai and the Yangtze. The region is bounded on both north and south by level land which extends up many valleys and surrounds the outlying hills. This is particularly true in Anhwei and Kiangsu where the region consists of low hills and there is a large agricultural population.

The Funiu Shan in Honan are structurally a part of the Central Mountain Belt, but, since they are loess clad, they are placed with the Loess Highlands.

BOUNDRAY

The boundaries of the Central Mountain Belt are less sharply defined than those of many other regions. Where the mountains border plains, there are usually intervening foothills which make the drawing of an exact boundary impossible. Where the region adjoins highlands or other mountains, there is even greater uncertainty as to the exact limits.

The boundary is most clearly marked in the vicinity of Sian in central Shensi, where there is a great fault along the valley of the Wei Ho. In this region the border range is the Hwa Shan, which rises abruptly above the loess plain. As described by Willis, the face of the mountain consists of stupendous precipices, one of which exhibits a smooth plane probably 2,500 ft. in height, with a slope of 70°. Elsewhere the front of the mountains is lower, but this precipitous character continues from the vicinity of Tungkwan to beyond Sian.

Farther west the boundary is less clearly marked but remains south of the Wei Ho as far as its headwaters. At this point the Tsingling merge with spurs of the Tibetan plateau and, in the absence of a distinct topographic boundary, the western limits of the region may be placed at about 105°E. Thus the Min Shan, which form the westward continuation of the Tsingling, are placed in the Tibetan Borderland.

On the south the Central Mountain Belt borders the Red Basin of Szechwan, and the limits of the region are located just within the provincial boundary. A short distance to the east of Wanhsien the regional boundary crosses the Yangtze and extends southward to include southwestern Hupei. The boundary then recrosses the Yangtze in the vicinity of Ichang and continues eastward next to the Yangtze Plain, as defined in the chapter on that region.

The northeastern portion of the Central Mountain Belt adjoins the Loess Highlands and the North China Plain. The mountains continue eastward to central Honan, but most of Honan is placed in the Loess Highlands. The east-west boundary, previously described

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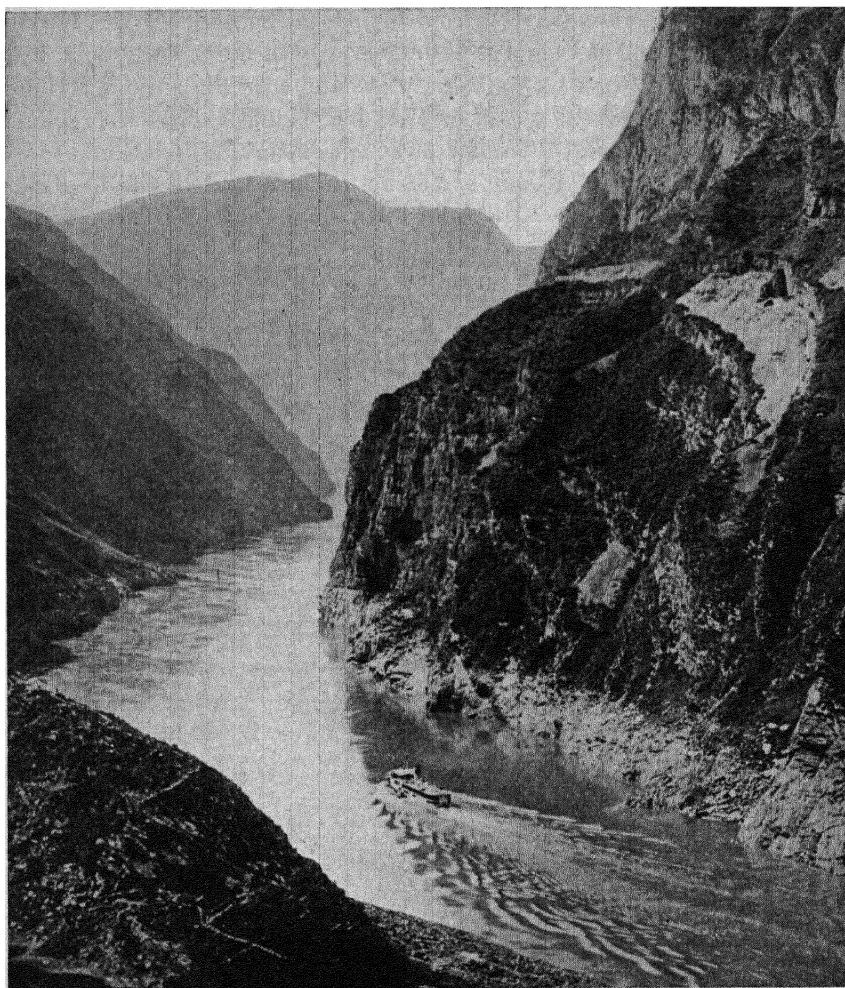


FIG. 135.—The gateway to Szechwan. From Ichang to Kweichowfu, the Yangtze gorges are one of the most difficult and beautiful waterways in the world. (*Ato Photographic Association.*)

in the vicinity of Tungkwan, turns south just east of the Honan border and continues to near Siangyang at the junction of the Han Kiang and the Pai Ho. From this point the limits swing east into Honan and continue south of the Hwai Ho across Anhwei into Kiangsu.

The mountains become lower and lower as they continue eastward and finally die out to the north of Nanking. The hills south of the Yangtze between Nanking and Chinkiang may be regarded as the extreme eastern limit of this long and varied geographic region.

The area amounts to 128,236 sq. miles (332,218 sq. km.).

THE YANGTZE GORGES ✓

The Yangtze Kiang cuts across the southern part of the Central Mountain Belt in a series of magnificent gorges. In the 400 miles

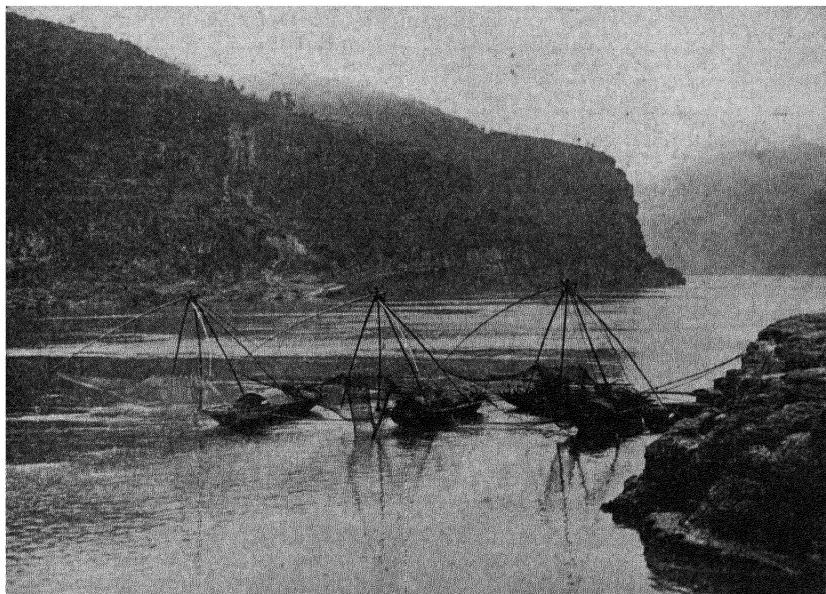


FIG. 136.—Fishing boats in the Yangtze gorges. Native passenger or cargo boats such as these must be pulled through the rapids by trackers who scramble over the rocks at the river's edge. (*Ato Photographic Association.*)

between Chungking and Ichang the Yangtze falls from an elevation of 635 ft. to 175 ft. This is an average drop of 14 in. per mile, but the gradient is considerably steeper in the canyon section below the city of Kweichowfu (Fengkieh).

These gorges are one of the most spectacular and at the same time accessible sights of China, and travelers come from distant parts of

the world to see them. Adjectives fail to describe their beauty. Sheer cliffs sometimes rise 2,000 ft. and the rushing river is imprisoned within tremendous canyon walls. Great domes tower above the channel and the traveler feels as though he were at the bottom of the world.

The structure is comparatively simple, with a broad anticline cut through by the river. The core is massive granite, overlaid unconformably by some 25,000 ft. of sediments ranging from Pre-Cambrian to Tertiary. The present canyon appears to be due to headward erosion and capture of Szechwan drainage since Tertiary times. Where hard limestone layers cross the river and in other localities where torrential tributaries have built great alluvial fans the valley bottom is no wider than the stream itself. At such places there are dangerous rapids, there being thirteen large and seventy-two smaller ones in all.

These rapids form serious handicaps for navigation, for the current is swift and the channel narrow and filled with rocks. The first attempts to improve the channel by blasting were undertaken in 1933. Native junks carrying as much as 50 tons of freight are dragged up the river by means of long bamboo cables pulled by as many as forty or fifty coolies who track along the banks, often clinging precariously to the face of the cliffs. Steamboats were introduced in 1898 by Captain Platt and Archibald Little. Navigation is extremely dangerous and wrecks are frequent, for in some places the current flows at the rate of 14 knots and the channel is strewn with rocks. This is probably the most difficult stretch of navigation in the world but is now regularly undertaken by numerous high-powered river boats, except during the winter, when the water is too low.

Large-scale hydroelectric developments are a possibility for the future.

THE PEOPLE

The population of the Central Mountain Belt amounts to 37,283,-237, giving an average density of 290 per square mile. The actual concentration is quite different from this, for many districts are almost uninhabited. One-third of the people live in Hupei. A limited valley-bottom agriculture is the one occupation. There are few important cities, for the chief trade centers lie outside the region.

COMMUNICATIONS

This region is handicapped by difficult communications. While the land forms in the east are lower and make travel somewhat easier,

the rugged ranges of the Tsingling and Tapa Shan form an extraordinarily effective barrier to travel.

The difficulties of transport on the Yangtze have already been referred to. The gorges of the Han Kiang present similar problems, although the volume of trade is much less. Apart from the rivers, the



FIG. 137.—The cost of transporting timbers on men's backs a day's journey in Anhwei frequently exceeds the original value of the trees. (*University of Nanking.*)

only transportation is by pack animals or coolie carriers. Only two important roads lead southward across the Tsingling, both of which start from Sian. One leads to the southeast by way of Lungchuchai, while the other extends to the southwest by way of Fengsiang and Liupa, reaching the valley of the Han in the vicinity of Hanchung.

TABLE XXVII.—CITIES OF THE CENTRAL MOUNTAIN BELT

City and province	"Christian Occupation of China" (1922)	Other estimates, with source
Hanchung, Shensi.....	100,000	
Laohokow, Hupei.....	100,000	150,000 (Local estimate)
Hingan (Ankang), Shensi	80,000	50,000 (Local estimate)
Ichang, Hupei.....	60,000	107,940 (Customs, 1931)

This latter trail continues across the Tapa to Szechwan and forms part of the old Imperial highway from Peking to Chengtu.

The Central Mountain Belt forms the gateway to Szechwan, and through it some day will be constructed a railway to tap the fertile Red Basin. As will be appreciated, the construction of such a railroad presents enormous engineering difficulties. There are two possible routes; one leads along the Yangtze through the gorges and has the advantages of easier grades and more direct approach. On account of the precipitous canyon walls, many tunnels and bridges will be required so that the cost of construction will be very high. The other route follows up the valley of the Han and from thence across the Tapa Shan, reaching Szechwan from the north. Surveys of both routes have been made, with the route up the Han estimated to be the cheaper of the two.

NOTE. Additional views of the Central Mountain Belt will be found in Figs. 20, 24 and 26.

CHAPTER XV

THE YANGTZE PLAIN

A LAND OF RIVERS AND CANALS

The Yangtze Plain is a land of rivers and canals. Probably nowhere else in the world is there an area with so many navigable waterways. The Yangtze Kiang, the Hwai Ho, and their tributaries provide a splendid highway through the length of the region.¹ In addition to the many rivers there are a series of great lakes, chief among which are the Tungting, Poyang, Tai, and Hungtze Hu. It is the canals, however, which give the most characteristic note to the landscape. These canals are the very arteries of life. In the region of the Yangtze Delta they form an intricate network and serve as an artificial drainage system which takes the place of rivers. Their length in the southern delta alone is estimated by F. H. King¹ at twenty-five thousand miles. All China is credited with two hundred thousand miles of canals, the bulk of which are in the Yangtze Plain. These canals supply transportation and furnish water to irrigate the fields, while the mud which is periodically dug up from their bottoms is spread over the land as fertilizer.

This region is a compound alluvial plain, the accumulation of sediment laid down by the rivers during long ages. There are a few isolated hills, but for the most part the land is level. The country is flat, but innumerable grave mounds and the trees about the villages break the view. Both rural and urban settlement is more congested than in the regions of the North, but factors of climate and location combine to make this the most prosperous part of China.

The Yangtze Kiang is the largest river in Asia and of foremost importance to China. Here and there are sand bars which form serious obstacles to navigation, but elsewhere the river is several tens of feet deep, in places as much as 150 ft. Ocean steamers of 6,000 tons regularly proceed 630 miles to Hankow, with 10,000-ton vessels in the summer. The Yangtze thus forms one of the finest inland waterways in the world.

The volume of water varies greatly, being lowest during the winter and spring and rising after the summer rains. Fortunately this increase seldom produces floods for the several large lakes serve as reservoirs,

¹ KING, F. H., "Farmers of Forty Centuries," 8.

receiving water from the Yangtze during the high-water season and retaining it until after the flood period is past. During the summer the Tungting Hu reaches a maximum size of 56 by 75 miles, and the Poyang is 20 by 90 miles. During the winter these basins become almost dry. So much mud has been deposited in them that their size is now greatly reduced and the area shown on most maps is much too large.



FIG. 138.—Where canals are at different levels, boats must be hauled up an incline by means of a double capstan. (*Robert F. Fitch.*)

The sediment carried by the river exceeds 600 million tons per year; expressed in another way this represents a contribution of a ton and a quarter for each man, woman, and child in China.¹ When the river loses its velocity through entering the ocean, its enormous load is deposited to form the delta. So rapid is this accumulation that the shore line is being built seaward at the rate of about one mile in seventy years.

The river once emptied into the ocean at Chinkiang, but the steady accumulation of sediments has pushed the seacoast eastward. It is probably at least two thousand years since the shore line was at Shanghai. The hills in the vicinity of Soochow were at one time islands

¹ CRESSEY, GEORGE B., The Geology of Shanghai, *China Journal*, VIII (1928), 334-345; IX (1928), 89-98.

in the sea but have now been surrounded by the delta plain. The remarkable growth of the delta is strikingly shown in the development of the island of Tsungming in the mouth of the river. A sand bank appeared in 620 A.D. and the island was settled in 1277. Tsungming

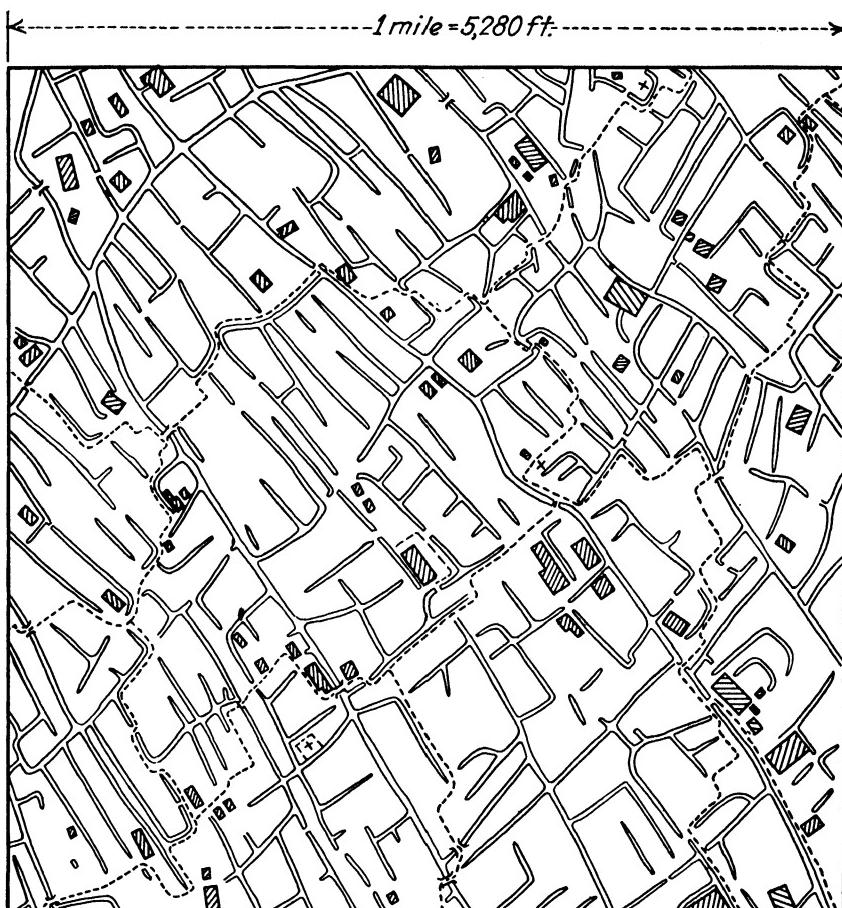


FIG. 139.—The canal system in one square mile of the delta southeast of Shanghai. The average distance between waterways is 380 ft., most of which are navigable. Foot-paths are dotted and farm clusters ruled. One inch equals 1,220 ft. (*Whangpoo Conservancy Board.*)

now has an area of about 275 sq. miles and supports a population (1926) of 790,000. This gives the amazing density of 2,873 people per square mile.

Shallow lakes and ponds occupy considerable areas in the vicinity of Hankow and in the delta. Planimeter measurements of the Shanghai-

Hangchow and Nanking maps of the British General Staff, drawn on a scale of 1:250,000, show that in the area south of the Yangtze from Wuhu to the sea, lakes and swamps cover 887 sq. miles, or over 15 per cent of the area. Almost exactly half of this is occupied by the Tai Hu. No measurement was made of the maze of canals and numberless smaller ponds, too small to be indicated on the map but large in aggregate.

If these lakes could be drained, it would add materially to the cultivable land. The problem of reclamation is not simple, for the altitude is near sea level so that it would be necessary to pump out the water, thus lowering the water table beneath the surrounding fields. These lakes are connected with the network of canals so that a lowering of lake level might drain the canals and be fatal to navigation and irrigation. Granting a solution of the engineering problem, the question remains as to the ultimate value of such an undertaking. If this added land should merely mean a place on the map for another million people, China will be no better off. What the nation needs is not more people to crowd the land, but improved conditions for those already there.

The regional area amounts to 75,753 sq. miles (196,252 sq. km.). Since the 1926 population numbered 67,943,471, there is an average density of 897 per square mile (250 per square kilometer). In some districts the concentration rises to several times this figure.

THE MENACE OF FLOODS

Most of the Yangtze Plain is comparatively free from flood menace. The river rises some tens of feet at Hankow each season, but through most of the Plain its channel is well defined or adequately diked so that disasters such as have been too common with the Hwang Ho were thought to be impossible. In 1931, however, a heavy concentration of rainfall due to a series of seven cyclonic storms during July, in contrast to a normal of two, raised the Yangtze to the unprecedented height of 53.6 ft. at Hankow on Aug. 19, sending a maximum volume of 2,800,000 cu. ft. per second past that city. If it had not been for the reservoir capacity of the various lakes, the flood would have been even higher. On Aug. 10, the storage in the Tungting Hu alone amounted to 40,000,000 cu. ft.

The 1931 flood¹ was the most disastrous ever recorded anywhere, seriously inundating 34,000 sq. miles and less seriously affect-

¹ BUCK, J. LOSSING, "The 1931 Flood in China."

STROEBE, G. G., The General Problem of Relief from Floods with Some Mention of the Yangtze River Flood, *Journal Association of Chinese and American Engineers*, XII (November, 1931), 8-11.

ing another 8,000 sq. miles. This compares with an area of about 25,000 sq. miles flooded by the Mississippi in 1927. In addition to those living in flooded cities, the farm population affected numbered 25,200,000. The loss of crops, buildings, furniture, animals, and farm equipment approximated 2,000,000,000, yuan. This represented a loss of 457 yuan per family, which was a major tragedy in view of the fact that the normal net earnings average about 300 yuan per year. In addition there was damage to dikes and roads and losses through the inability to plant winter crops. The flooded areas along the middle Yangtze and Hwai were almost coextensive with the limits of this geographic region.



FIG. 140.—Flood waters of the Hwai Ho, here shown breaking across the Grand Canal, inundated thousands of square miles in 1931. The city in the foreground is Kaoyu, Kiangsu. (*Charles A. Lindbergh, courtesy China Famine Relief.*)

✓ The Hwai Ho is the second largest river of the region and is unique in that it is a river without a mouth. In 1191 A.D. the Hwang Ho changed its course and usurped the lower channel of the Hwai. In the course of time the Hwang deposited great quantities of sediment and thus gradually built its bed so high that the Hwai was no longer able to follow its natural outlet to the sea.

At present the Hwai Ho depends chiefly upon the Grand Canal and the lakes connected with it to discharge its waters into the Yangtze. The Hungtze Hu acts as an equalizer and somewhat regulates the outflow from the Hwai. In times of flood the quantity of water is so

THE YANGTZE PLAIN

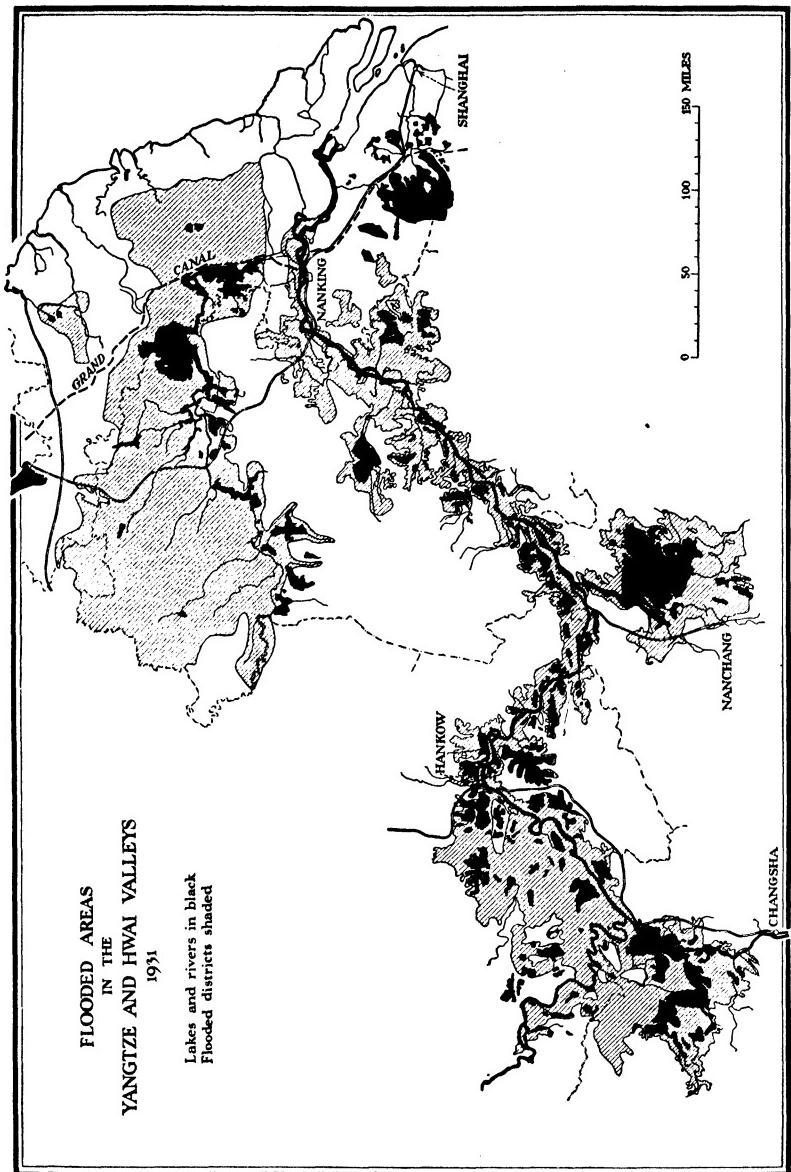


FIG. 141.—The seriously flooded areas along the Yangtze and Hwai Rivers in 1931 amounted to 34,000 sq. miles.
(*National Flood Relief Commission*.)

great that the surface of the Hwai Ho and Hungtze Hu rise abnormally and large areas are flooded. In 1911 there was a disastrous flood which inundated 18,000 sq. miles in northern Anhwei and Kiangsu. The district menaced by periodic flooding is excellent farming land, and covers an area larger than Belgium. With proper drainage it is esti-

mated that enough land might be available to support upwards of ten million people.¹

The problem of the Hwai Ho has been studied by a number of engineers and various projects have been drawn up. The National Government is now in the process of improving the present outlet to the Yangtze and providing a new supplementary channel directly to the sea. The economic gain from such conservancy works will be enormous, having been estimated by government authorities at no less than a billion yuan a year.

IRREGULAR BOUNDARIES

Around the borders of the Yangtze Plain alluvial areas reach up into the surrounding mountains, while isolated rock hills project through the mud flats. It is therefore impractical to draw sharp boundaries or to restrict the geographic region exclusively to level land, although plains characterize the greater part of the area. The shape of the region is quite irregular. In two localities the hills approach the river on both banks and the plain is of limited width; elsewhere it widens and the limits are as much as one hundred miles from the river.

West of Hankow there is a large area which includes numerous isolated hills and many lakes, the chief of which is the Tungting Hu. This part of the Yangtze Plain lies in Hupei and Hunan and the level land extends to within 40 miles of Ichang and nearly to Changsha. In the southwest the boundary is near Changteh. Along the railroad north of Hankow the plain extends for 70 miles to the edge of the Central Mountain Belt.

Between Hankow and Kiukiang the level land is restricted to narrow plains along the river or among the hills. From Hankow to the vicinity of Tayeh the region lies largely to the south of the river, while east of Kaichow there is level land on the north to the vicinity of Anking.

South of Kiukiang lies the basin of the Poyang Hu in central Kiangsi. This plain has only a narrow opening to the Yangtze but resembles the rest of the geographic region in all essentials. As sedimentation continues, more and more of the former lake bed is being reclaimed. Most of the level land is south of the lake and the boundaries extend nearly to Linkiang along the Kan Kiang. Nanchang is thus within the Plain.

From Kiukiang to Chinkiang the region is again restricted by hills which sometimes come to the water's edge and elsewhere recede. The width of the region in this area seldom exceeds 20 miles.

¹This area on the border of the North China Plain and the Yangtze Plain is described in Pearl Buck's "The Good Earth."

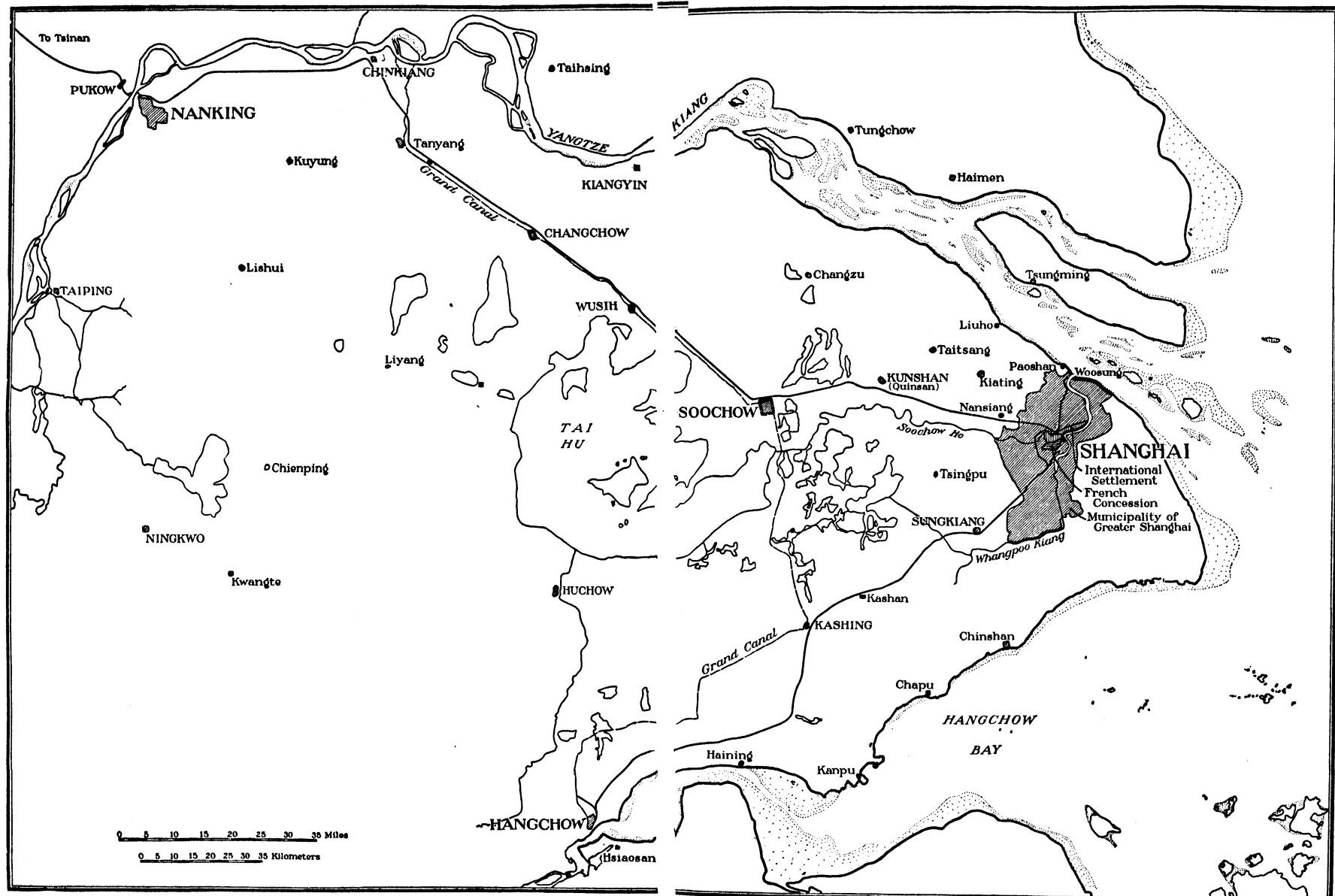


FIG. 142.—Shanghai, Soochow, Hangchow, and Nanking are the principal centers of the Yangtze Delta. Innumerable canals provide a network for transportation and irrigation.

Eastward from Wuhu the hills disappear and the plain extends from the Yangtze directly to the Tai Hu and the sea, as well as following the river, thus encircling the low mountains around Nanking which properly belong to the Central Mountain Belt.

The largest and most important part of the region is the delta of the Yangtze which begins at Chinkiang and covers a large part of Kiangsu and northern Chekiang. Although Hangchow is outside the delta proper, the level plain continues to it without break and it is included in the region. A maritime dike extends along the shore of Chientang Bay around to Woosung, so that most drainage from the vicinity of Hangchow is diverted northward to the Whangpoo. The narrow plain south of the bay around Shaohing and as far east as Ningpo is similar to the delta and marks the southeastern limit of the region.

To the north the level land of the Yangtze joins with that of the Hwai Ho. The limits of the geographic region in this vicinity lie north of the Hungtze Hu and extend eastward from Tsingkiang to the sea. To the west of the lake the region continues along the valley of the Hwai Ho to the western boundary of Anhwei. This boundary has already been described in connection with the North China Plain. There is no topographic break and the limits are established on the basis of soil, rainfall, and agriculture.

TRANSPORTATION FACILITIES

The Yangtze Plain has unexcelled facilities for transportation by water. The river itself provides a splendid waterway, being broad, deep, and fairly straight. Most important of all, it flows through a rich area in a favorable direction. The Yangtze is especially well situated for commerce with Japan and the United States, with whom China carries on her principal trade. A large number of ships are constantly moving up and down the river, engaged in local commerce or in collecting or distributing the foreign trade which centers in Shanghai. Other smaller rivers, such as the Han or those associated with the Tungting or Poyang Hu, are navigable for small steamers or junks. The Hwai Ho has a considerable junk traffic but is too shallow for steam launches and flows through a less productive region.

The most distinctive waterways are the canals. These canals take the place of roads and there are few villages which are not on a navigable canal. This means economical, though slow, transportation. Steam launches provide frequent service between the chief cities but labor is so cheap that cargo boats are operated by man power, being

rowed by an oar at the stern, pushed by a pole, or pulled by trackers along the bank.

One of the noted canals of the ancient world was that built to carry the tribute rice from the Yangtze Plain to the court at Peking. The Grand Canal starts at Hangchow, passes around the city walls of Soochow, and crosses the Yangtze Kiang near Chinkiang. It continues north through Yangchow and leaves the region of the Yangtze Plain at Tsingkiangpu. The section of the canal which lies in the North China Plain is partially out of use, for in some sections it has become silted, while in others it is dry during the winter.

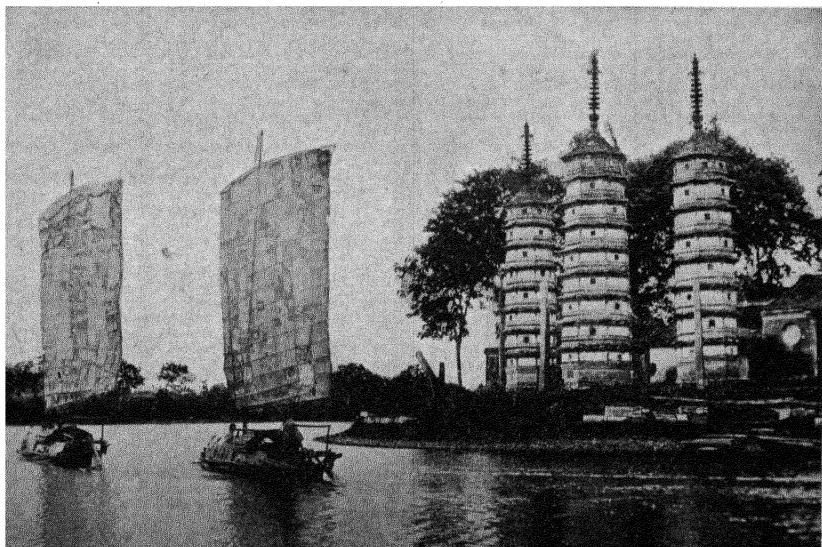


FIG. 143.—The Grand Canal near Kashin, dug to carry tribute rice to Peiping, 700 miles away. (*Publishers Photo Service.*)

In regions where overland travel is desired, sedan chairs and coolie carriers are used. Pack animals and cart roads are absent. A few automobile roads have been built, but the presence of rice fields and canals makes construction difficult.

✓ Owing to the cheapness of travel on the Yangtze, the railway lines tend to be at right angles, rather than parallel, to the river. In the west there is the southern section of the Peiping-Hankow Railway and the line from Wuchang to Yochow and Changsha. The central portion of the region has one railway, that from Kiukiang to Nanchang, while in the east there are three lines. The Tientsin-Pukow Railway reaches the Yangtze opposite Nanking where a train ferry connects

with the Shanghai-Nanking Railway. The southern delta is served by the Shanghai-Hangchow-Ningpo Railway which has an incompletely section east of Hangchow.

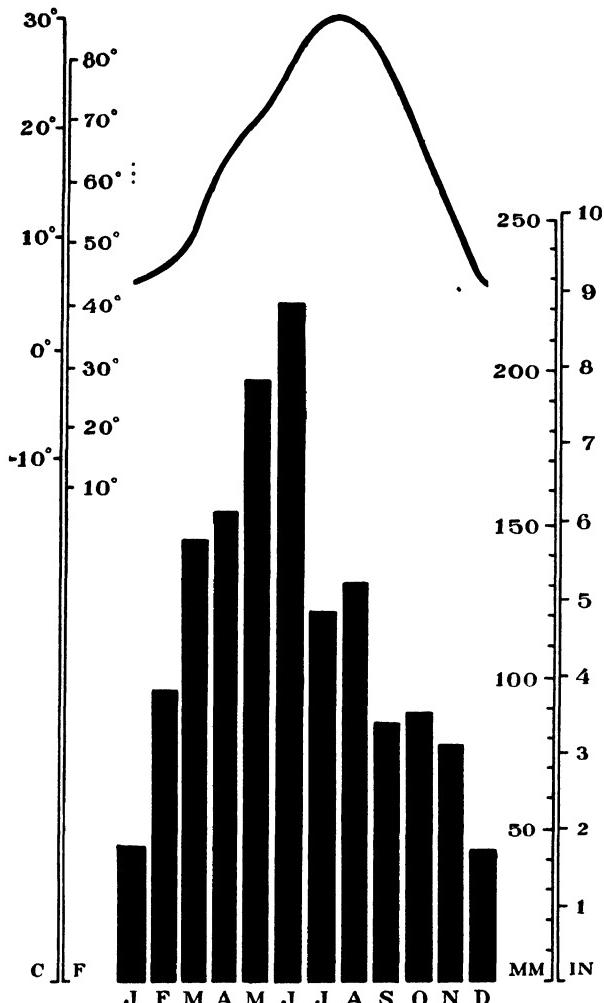


FIG. 144.—Climatic conditions in the Yangtze Plain. Rainfall based on Shanghai (1,148 mm.), Nanking (1,069 mm.), Wuhu (1,219 mm.), Hankow (1,259 mm.), and Yochow (1,323 mm.). Temperatures for the same stations.

THE CLIMATIC BACKGROUND

The Yangtze Plain is more distinctly influenced by summer-monsoon conditions than any region yet considered. Here, too, are felt the greatest effects of the continental cyclonic storms.

Owing to the southerly latitude, the summers are subtropical with temperatures which frequently rise to 38°C. (100°F.). The rainfall map on page 61 shows a regular decrease from south to north so that those portions of the Plain which are farthest south have the highest precipitation. The average for the entire region is about 1,200 mm. (45 in.), but at Kiukiang it increases to 1,466 mm. (58 in.), while in the valley of the Hwai Ho it drops to 800 mm. (30 in.). The change from east to west is very slight, Shanghai and Hankow having roughly the same amounts. Most of the rain falls during the spring and summer, with June the雨iest month. The period from October to February is comparatively dry with clear skies and stimulating temperatures, making this the most pleasant season of the year.

Winter temperatures seldom remain below freezing for more than a few days at a time. Ice forms only in thin sheets on the colder nights and there is little snow. Although summer temperatures of the Yangtze Plain resemble those of the North China Plain, winter conditions are much more mild. The average of summer maximum temperature for Shanghai is 37°C. (99°F.), and the average of winter minimum is -7°C. (19°F.). These figures are very similar to those of Hankow and other cities in the Yangtze Valley.

The Yangtze Plain has climate conditions which are favorable for agriculture during most of the year so that the growing season lasts for about 300 days. The excessive humidity makes the summer months enervating, especially for foreigners from the cooler lands of Europe and North America. On the other hand, the climate of the fall and early winter is stimulating and delightful.

MAN'S USE OF THE LAND

Throughout the region the landscape is characterized by the most intensive utilization. Except in the hills, no land is unused. Grave mounds furnish pasture for water buffalo, and grasses are cut from the ponds as green manure. Despite the urbanization of this region, some two-thirds of the people are farmers. Excessive amounts of hand labor are employed, draft animals being limited to the stolid water buffalo, and minute care is given to every detail of cultivation.

The soils are brownish with poorly developed profiles due to the poor drainage and the recency of their accumulation. Silt and clay predominate, spread out by periodic floods of the rivers. The productivity is high, a result in part of the widespread use of fertilizers. In this densely populated region, all night soil is carefully collected. Processions of boats or wheelbarrows heavily loaded may be seen leaving every village each morning. As one walks through the country-

side, vats or cisterns containing night soil or composting material are to be seen on all sides, giving to China its characteristic odors. Canal sediment, rice chaff, and all waste vegetable matter are carefully applied to the fields.

Summer rains are abundant, but when additional water is needed it may be obtained from the canals. The most common means of lifting water from ponds or canals, or from one paddy field to another, is an endless chain of paddles running in a wooden trough. These are operated by buffalo or by human treadmills. Mechanical pumps operated by oil engines are coming into use in some districts.)

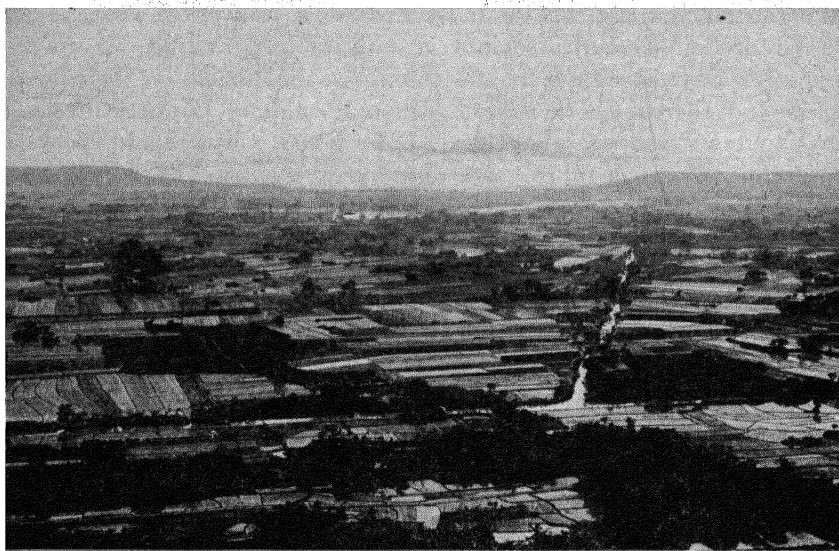


FIG. 145.—Rice fields and clusters of farmhouses between Soochow and the Tai Hu.
(*Ah Fong.*)

The chief farm tools are an iron-tipped wooden plow, a spade, and a hoe. Even the plow may not be used and on many small farms the soil is prepared by a three-pronged implement swung like a hoe. With present agricultural practices, the use of American farm machinery is quite impractical. The fields are too small, there is not the available capital, and with the present population density they would not be economically profitable. Scientific agriculture, however, can make large contributions in the way of improved crops with better yields.

The farms are small. Surveys by Southeastern University at Nanking covering 40 million mow in Kiangsu indicate that 22 per

cent of the farms contain less than 5 mow, 41 per cent range from 5 to 15 mow, 29 per cent have between 15 and 50 mow, while farms over 50 mow number 8 per cent. Studies under the direction of Buck in seven localities in the eastern half of the region show a mean size of 35.7 mow, with a median of 31 mow. Individual fields seldom measure as much as 500 ft. Agriculture of this type requires such individual attention that it may well be termed gardening rather than farming.

✓ Owing to the intensive care, the yield per mow is large; but since so much labor is required for each field, the return per person is small.



FIG. 146.—Canals and ponds yield a harvest of water chestnut. (*Mactavish and Company.*)

It is this latter fact which largely accounts for the low standards of living. The problem of the farmer is not merely to increase the total production, but to raise the per capita yield. Expressed otherwise, it is not the income per mow, but the yield per mouth that matters.

✓ In general, two crops are raised each year, but when vegetables are grown three crops may sometimes be obtained. Rice is the outstanding summer crop and the whole countryside is then one vast succession of paddy fields, the exceptions being those areas where mulberry or cotton is dominant. These fields are flooded in the early spring. After the fields have been plowed and thoroughly softened the

rice is transplanted from special beds where it has been given a month's start. The fields are kept flooded until the grain is ready for harvest, which occurs after 100 to 110 days. Studies by Buck in seven localities in Anhwei, Chekiang, and Kiangsu show an average yield of 51.9 bu. per acre. Rice is commonly planted late in April but may be started at any time from the first of that month till mid June, according to the use of the land for other crops.

During the winter months the fields are dry and are used for raising wheat, beans, rape-seed, and barley. These winter crops are grown on raised ridges to provide better drainage during the spring rains. Cotton is a summer crop of increasing importance, especially in Kiangsu north of the Yangtze, and near Shaohing in Chekiang, the annual yield being estimated at 500,000 and 100,000 bales of 500 lb. each, respectively. Rice and cotton harvests occur in October, and by November the country is again green with wheat, barley, or beans.

The relative importance of the various crops is approximately as follows, making allowances for the fact that most fields are used twice: rice 40 per cent, wheat 25 per cent, beans 10 per cent. Cotton and mulberry may represent 5 per cent each, although locally running to 50 per cent. Vegetables occupy large areas near the cities, but their total area is unknown.

The area of cultivated land reported to the Ministry of Agriculture and Commerce amounts to 204,244,201 mow. This represents 71 per cent of the entire region and is the highest percentage in the country, ranking above the North China Plain. When divided by the total population, this means that the average area of farm land per person is 2.1 mow. This figure is only about half as much as that of the North China Plain and is explained by the fact that the climate permits two or even three crops to be raised, and that rice gives a larger return per mow than the cereals of the north. Even so, the area of cultivated land per person is pitifully small.

SILK

The production of silk is of great importance in the Yangtze Plain, especially in the southern half of the delta. It forms the chief cash crop and is extensively produced around the Tai Hu and in the vicinity of Hangchow. The finest white silk in the world is obtained in the vicinity of Wusih. In this locality and also near Huchow and Hangchow from half to a quarter of the land is devoted to mulberry cultivation.

Silk is a filmy thread formed by the silkworm and wrapped round and round its body to form a cocoon. These worms are fed on mulberry

leaves, the cultivation of which has become a specialized agricultural art. If allowed to grow normally, the mulberry is a full-sized tree. Where cultivated for its leaves, the trunk is cut back to three feet, and the leaves are taken from slender shoots which grow out to about the same distance, thus giving the appearance of a bush rather than a tree.

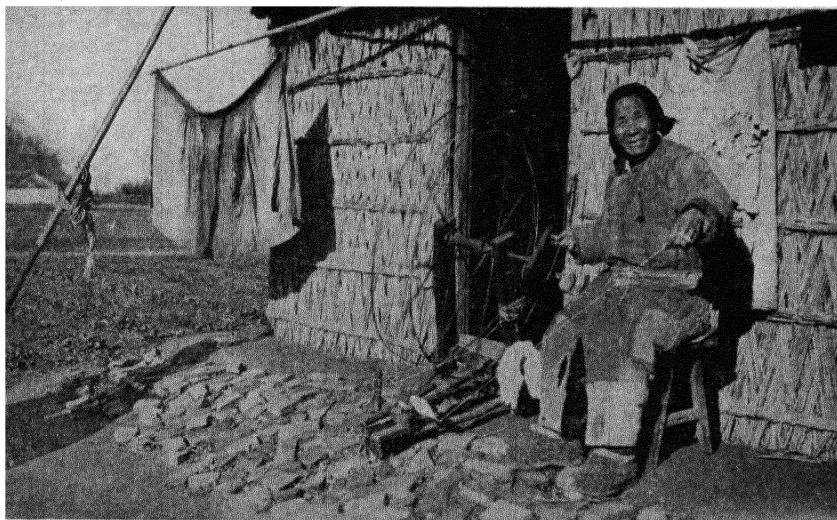


FIG. 147.—Home industry is still the rule. This woman is reeling cotton, probably grown in her son's fields. (*Paul O. Nyhus.*)

In order to produce an abundant harvest of leaves the mulberry needs to be carefully fertilized. The best material seems to be human waste or night soil, but in the case of farms too distant from cities, or where the supply is too limited, bean cake or straw ashes are used. In addition, the mulberry fields are regularly plastered with mud from the canals and small ponds which are so characteristic of the delta landscape. For convenience, mulberry plots are usually located next to these water bodies, and so much mud has been added to them that they are commonly from three to six feet above the level of the adjoining rice fields.

Mulberry trees produce from 40 to 200 lb. of leaves in a year. The trees are planted five or six feet apart and the annual yield is from 24,000 to 120,000 lb. of leaves to an acre. Since it requires from 1,500 to 2,000 lb. of leaves to feed the worms from 1 oz. of eggs, the harvesting of these leaves requires much labor, and the entire family is pressed into service during the month when the worms are growing.

Many silkworms are diseased and do not produce proper cocoons. In many cases as much as one-half of the mulberry leaves are fed to diseased worms and so wasted. By the use of disease-free eggs and no increase in labor or mulberry leaves, the production could be considerably increased. This and other simple changes might make China a much larger exporter of silk and add greatly to the national wealth. After the cocoons are formed, the chrysalis is killed by steaming and the cocoons are reeled by hand or in steam filatures.

TABLE XXVIII.—CITIES OF THE YANGTZE PLAIN

City and province	"Christian Occupation of China" (1922)	Mari-time Customs (1931)	Other estimates with source
Shanghai, Kiangsu.....	1,500,000	3,259,114	3,249,152 (Census, 1932)
International Settlement..	....	....	1,007,868 (Census, 1930)
French Concession.....	....	....	434,807 (Census, 1930)
Municipality of Greater Shanghai.....	....	....	1,645,635 (Census, 1932)
Wu-Han, Hupei.....	750,000	....	1,617,055 (Census, 1932)
Hankow.....	350,000	777,993	1,157,708 (Census, 1932)
Hanyang.....	150,000	....	137,241 (Census, 1932)
Wuchang.....	250,000	....	322,106 (Census, 1932)
Nanking, Kiangsu.....	300,000	633,452	621,864 (Census, 1932)
Hangchow (Hangsien), Chekiang	650,000	506,930	517,935 (Census, 1932)
Soochow (Wuhsien), Kiangsu	600,000	260,000	500,000 (Arnold, 1926)
Nanchang, Kiangsi.....	480,000	....
Ningpo (Ninghsien), Chekiang.....	450,000	218,774	212,397 (Census, 1928)
Shaohing, Chekiang.....	400,000	....	400,000 (Shun Pao)
Yangchow (Kiangtu), Kiangsu.....	300,000	....	250,000 (Arnold, 1926)
Chinkiang, Kiangsu.....	260,000	199,776	146,700 (Shun Pao)
Wuhu, Anhwei.....	175,000	135,385	126,800 (Arnold, 1926)
Wusih, Kiangsu.....	150,000	....	196,545 (Census, 1929)
Hwaian, Kiangsu.....	180,000	....	180,000 (Shun Pao)
Tsingkiang, Kiangsu.....	130,000	....	130,000 (Shun Pao)
Changchow (Wutsin), Kiangsu.....	125,000	....
Sungkiang, Kiangsu.....	100,000	....	100,000 (Shun Pao)
Taichow (Taihsien), Kiangsu.....	100,000	....
Kashing, Chekiang.....	100,000	....	100,000 (Shun Pao)
Anking (Hwaining), Anhwei.....	100,000	....	111,212 (Shun Pao)
Huchow (Wuhing), Chekiang.....	100,000	....
Shasi, Hupei.....	87,000	113,526	95,000 (Arnold, 1926)
Kiukiang, Kiangsi.....	85,000	80,166	36,000 (Arnold, 1926)
Nantungchow, Kiangsu.....	65,000	....	150,000 (Arnold, 1926)

At the opening of the century, China and Japan were exporting approximately equal quantities of silk. Since that time there has been little change in the volume of China's trade, while Japan has increased her silk export enormously and in normal years receives nearly a billion yen (\$500,000,000 in United States currency) a year for her overseas shipments.¹ Since Chinese silk is intrinsically superior, this offers a striking contrast in agricultural and business methods. In Japan the government has in every way encouraged scientific study, and the exporting companies have closely followed the specifications of the purchasers, chiefly Americans, with regard to preparing and reeling the silk. In China, on the other hand, the eggs are still usually carried about in the clothes of the farmers or placed in the bedding to make them hatch. Thus they often become dirty and diseased and many eggs fail to mature. The Chinese farmer and most of the silk filatures have shown a remarkable and costly conservatism in clinging to age-old customs.

SHANGHAI: GATEWAY TO CHINA

Less than a century ago, Shanghai was an inconspicuous fishing town, yet today it is the outstanding city on the Asiatic continent. The name Shanghai dates from 1280 A.D., but the village was not walled until frequent raids by Japanese pirates made this necessary in 1554. As early as 1756, the advantages of Shanghai as a base of operations, in what to the British was then North China, were pointed out by agents of the British East India Company; but when Lord Amherst visited the region in 1832, he preferred the Chusan Islands near Ningpo. Shanghai was finally opened to foreign trade and residence in 1843 and within two years handled one-fifth of China's imports and exports, increasing to a half by 1851. One of the more significant events in the city's history occurred during the Taiping Rebellion in 1853. The original settlement outside the old city walls was designed primarily for foreign residents but, when the Native City was captured by revolutionists, thousands of the Chinese moved to the foreign areas for protection, which since that time have been overwhelmingly Chinese in population.

Even the great founder of the Chinese Maritime Customs, Sir Robert Hart, failed to foresee the future importance of Shanghai, expecting instead that Chinkiang or some other river port would monopolize the trade. When the dredging of the sand bar at the mouth of the Whangpoo near Woosung was under consideration in 1875, he wrote:¹

¹ Quoted in Shanghai 1843-1893, *The Shanghai Mercury* (1893), 37; also in F. L. Hawks Pott, "A Short History of Shanghai," *Shanghai: Kelly and Walsh* (1928).

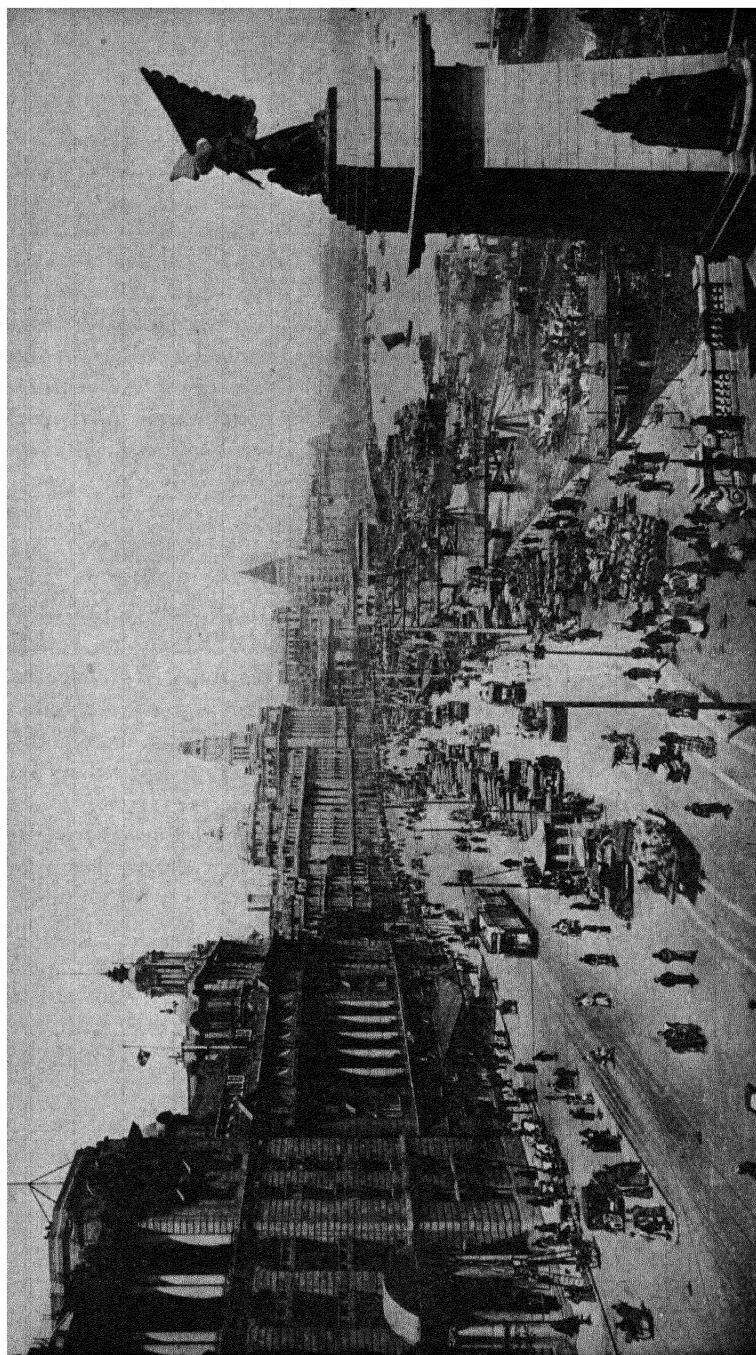


Fig. 148.—The cosmopolitan Shanghai Bund, with its diverse traffic. The building with the dome houses the Hongkong-Shanghai Bank, the clock tower is on the Custom House, while the pyramid roof marks the Cathay Hotel. The tidal range of 5 to 13 ft. in the Whangpoo necessitates the use of landing stages. Most steamers anchor in mid-stream. (*Burr Photo Company*.)

" . . . the question of the Woosung bar is seen to mean that dredging there may possibly be nothing more than a means of making the last days of Shanghai a little more comfortable than they would otherwise be; it will not prolong the life or avert the commercial death of the place, but it will make a show of vitality during its declining years more possible."

The growth of Shanghai is a continuous record of overcoming difficulties. The site of the city is a tidal flat bordering the shallow and winding Whangpoo River. It lies 14 miles from the Yangtze estuary, which itself has a troublesome sand bar in the Fairy Flats. Poor as the geologic setting may be, Shanghai has the only practical harbor near the mouth of China's greatest river. The city itself lies on the west side of the Whangpoo at the junction of Soochow Creek, giving access by canals to Hangchow and Soochow. The environs do not contain minerals, fuel, water power, wood, or stone. On this mud flat, with bedrock at least a thousand feet below the surface, has developed a great world city with steel and concrete buildings rising to 300 ft. The Whangpoo has been dredged to a low-tide depth of 28 ft. and a start is being made on the herculean task of deepening the Fairy Flats.

Metropolitan Shanghai is made up of three separate political areas; the International Settlement which contains the commercial core, the French Concession which is largely residential, and the surrounding Chinese Municipality of Greater Shanghai. Industrial areas follow the river or railways and shipping occupies the waterfront with 89,218 ft. of wharves and pontoons. Mechanical unloading facilities are limited, and many vessels discharge cargo into lighters in midstream. Chinese residential areas are found in all three political sections, reaching their greatest concentration in the northern part of the International Settlement, where two police districts, almost entirely composed of two-story houses, have a density of 316,160 people per square mile. The principal business street is The Bund, facing the river and lined with an imposing array of splendid buildings.

The business center of Shanghai is so cosmopolitan that it might as well be in the Occident. Scores of industrial enterprises are entirely abreast of world trends. Scattered throughout the city, however, are inclusions of old-style activities, giving to Shanghai vivid contrasts within short distances. These are most pronounced as one steps from Frenchtown into the old Native City with its narrow crowded streets, or as one passes directly from the agricultural countryside to industrial areas. Coolie carriers vie with huge motor trucks, and

the thirty thousand rickshaws compete with ten thousand automobiles. There are a half dozen newspapers in English as well as scores in Chinese. Here one may find traffic lights, high-speed elevators, air conditioning, the latest moving pictures, and ideas from the ends of the Earth.

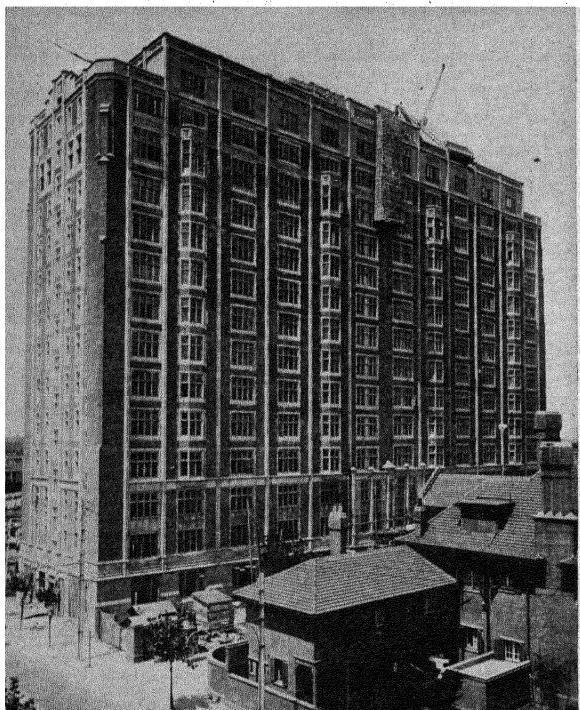


FIG. 149.—This fifteen-story apartment hotel in the French Concession of Shanghai rests on long piles driven into the delta mud. (*Ah Fong.*)

Why has Shanghai grown? Few cities in the world have so large and potentially rich a hinterland. Shanghai is the one natural outlet for the rich Yangtze Valley with an area of 750,000 sq. miles and a population of 200 million people, one-tenth of the human race. While their per capita output and purchasing power are still low, the aggregate is enormous and increasing. The near-by Yangtze Delta has a population density of some two thousand per square mile and is the principal silk- and cotton-producing area of China. In addition to its location at the mouth of the Yangtze, Shanghai occupies a central position between the North and South, which makes it an important transhipment point for international trade. No other Chinese port is so close to Japan or so well situated with respect to the great steamship

routes of the Western Pacific, the one to North America and the other to Europe. Added to these advantages are the largely undeveloped mineral resources of central China. Credit must also be given to foreign initiative which has aided the development of trade and industry and has made the Settlement a haven of refuge during the all-too-frequent periods of disorder in the interior. This security has caused Shanghai to boom in spite of China's troubles. Building permits in 1930 reached a record total of 69,000,000 taels.

Shanghai has three principal functions: commercial, industrial, and cultural. The first of these grows out of its geographic situation and is permanent. This business leadership is shown by the figures of shipping for ". . . the total tonnage entering the harbor during the year 1931 was 21 million tons, which figure places Shanghai on an equal footing with Osaka as seventh on the list of the great ports of the world in point of tonnage. . . ."¹ In value of imports and exports, Shanghai ranked eighth among world ports in 1929, with a total value of \$638,941,000 (United States currency).²

In the field of industry Shanghai has only cotton and silk to draw upon locally. These employ 100,000 and 60,000 workers, respectively. Her other varied activities are the result of circumstances and accessibility to markets or imported materials. In 1929 Shanghai had 1,781 modernized factories. In so far as raw materials are more available in other parts of China, Shanghai's manufacturing operations may be expected to proportionately decline; but in those fields where imported products or skill play a part, Shanghai will grow industrially. The cultural significance of the city is large and increasing, and it should long remain the chief intellectual gateway to the new China.

The growth in population has been no less spectacular than the increase in activities. The foreign population which numbered but 50 in 1844 grew to 210 by 1850 and by 1900 reached 7,396. In 1930 there were 59,285 foreigners of some 50 nationalities. Japanese, Russians, British, Americans, and French lead in the order named. The American group numbers some 4,000, forming one of the most important American communities outside the United States. Early records of the Chinese population are lacking, but the number was estimated at 250,000 in 1870 and 1,000,000 in 1910. By 1930 the total exceeded 3,000,000, placing Shanghai among the half dozen largest cities in the world.

¹ Inspector General of Customs, "Foreign Trade of China, 1931," Shanghai: Chinese Maritime Customs, I (1932), 25.

² Personal communication from U.S. Bureau of Foreign and Domestic Commerce, Dec. 21, 1931.

When all of China is knit together by adequate transportation, under stable government, and with developed resources, Shanghai will undoubtedly become one of the world's greatest marts of trade. When that time comes, the city may be expected to grow in the direction of Woosung at the mouth of the Whangpoo, filling up all the land toward the Yangtze.

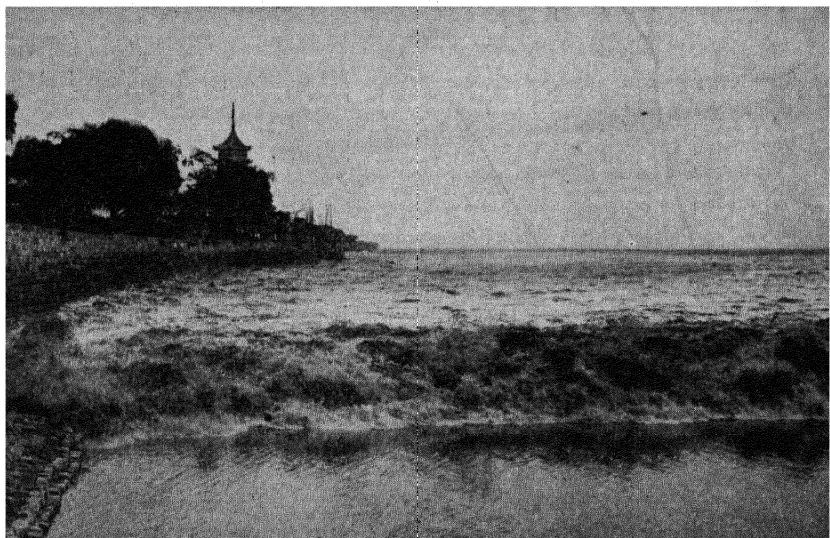


FIG. 150.—The funnel-shaped Hangchow Bay so constricts the incoming tide that it piles up in a great wave or bore which advances with a roar and a speed up to 6 knots. (*Ah Fong.*)

WU-HAN, NANKING, AND SOO-HANG

The junction of the Yangtze and the Han is the site of China's second largest urban center, the Wu-Han cities of Hankow, Hanyang, and Wuchang with a combined population of over a million and a half. If Shanghai be likened to New York, then Wu-Han becomes China's Chicago. The cities combine the advantages of being near the head of ocean navigation, with a position midway on the railway from Peiping to Canton. Although a section of this line south of Changsha is still incomplete, Hankow derives a large traffic from this great north-south railway. During the summer high-water period, some three dozen ocean vessels call at Hankow.

Hankow lies on the north bank of the Yangtze and is the principal business center, with modern streets and buildings in the former foreign concessions. Across the Han Kiang is the industrial city of Hanyang,

once famous for its great blast furnaces which are now out of operation. Wuchang, the oldest of the cities and the capital of Hupeh, lies on the south bank of the Yangtze and carries on extensive local trade in contrast to Hankow's foreign interests.

The third largest city in the Yangtze Plain is Nanking, the population of which has nearly doubled since it became the capital in 1928.



FIG. 151.—Shops in Ningpo. Although open to the street by day, they are closely boarded up at night. (*Ato Photographic Association*.)

When Nanking was the seat of the Southern Sung and Ming Empires prior to 1416, the city rivaled Peking in its splendid public buildings and was surrounded by a city wall 22 miles in length, the longest in China. All trace of its former beauty was destroyed during the Taiping Rebellion. There is little industry and its present importance is largely political. Across the Yangtze lies Pukow, at the terminus of the railroad to Tientsin.

Two other cities deserving special mention are Soochow in Kiangsu and Hangchow in Chekiang. They are linked together in the Chinese expression "Heaven above, Soochow and Hangchow below." These cities have played a famous part in history and are the subject of much poetical lore. Soochow is near the Tai Hu, two hours' journey west of Shanghai and is an old, unmodified, and typical city of the South, with scarcely a single street inside the city walls wide enough

for an automobile, and many where there is but room for a single rickshaw. It is famous for attractive gardens and beautiful women, and the abundance of canals has given it the name of the Venice of China.

In contrast to conservative Soochow, Hangchow is one of the most modern of purely Chinese cities, with broad streets and much civic pride. The chief attraction of Hangchow lies in the beautiful West Lake which is surrounded by pagodas and temples, visited by hundreds of thousands of tourists annually. It lies south of Shanghai five hours' journey by train. Both cities are important centers of the silk industry.

THE LEADERSHIP OF THE YANGTZE PLAIN

The Yangtze Plain is the political, cultural, industrial, and commercial center of present-day China. No other region includes so



FIG. 152.—Students of the new China at the University of Shanghai, the first collegiate institution to introduce coeducation.

many important cities, the total population of those with over one hundred thousand people amounting to some ten million. Here, too, the standards of living are higher; at least there are more people of comparative wealth and culture.

One of the distinctive marks of the Yangtze Plain is the rising tide of industrialism. The region is being transformed by the introduction of machines. The old industry of China was carried on by craftsmen, often of a single family group, using simple tools. To a certain extent the new machine industry has merely modified this small-unit production, and in many cities one may see row after row of small semimodern shops, each with from five to twenty laborers, many of them contract apprentices. Such shops introduce a lathe, weaving machine, or printing press and thus gradually change the economic order.

The industrial development of the Yangtze Valley is not confined to these small factories. Every city of size has an electric-light plant, and all of the larger ports or railway towns have numerous modern factories. In this region there are over 75 cotton mills, some 200 silk filatures, about 40 flour mills, 20 plants for preparing egg products for export, and a dozen tobacco factories. Cement plants are found in three localities near Shanghai with others up the river. Large blast furnaces for reducing iron ore have been built at Hanyang and Tayeh, and there are several shipyards in Shanghai. The electric generating plant of the Shanghai Power Company has a capacity of 161,000 kw. and is one of the largest and most efficient steam-operated plants in the world. Another example of modern industry is the publishing house where this book was to have been printed. The Commercial Press in Shanghai had, until destroyed by the Japanese in 1932, a thoroughly modern printing plant employing some three thousand men and turned out a constant stream of books and magazines in both English and Chinese.

This region is also the chief educational and social center of China. It contains approximately half of the colleges and the percentage of students in elementary and middle schools is probably higher than that in any other region. While the Yangtze Plain does not have the cultural heritage of North China, the influence of western civilization, both good and bad, is most pronounced in this area. It is here that the new China is evolving.

NOTE. Additional views of the Yangtze Plain will be found in Figs. 5, 8, 9, 12, 17, 18, 39, 40, 42, 50, 53, 62, and 65.

CHAPTER XVI

THE RED BASIN OF SZECHWAN

THE TOPOGRAPHIC ENVIRONMENT

The Red Basin is one of the most attractive and fruitful geographic regions in China. The climate is favorable, the soil productive, the people are energetic, and the natural resources abundant. Szechwan is one of the most enthusiastically praised provinces of China, and it is said that everything which can be grown anywhere in the country may be produced here. Every traveler returns with an account of the prosperity and glories of Szechwan, and one writer has even spoken of this as the "Eden of the Flowery Republic."

Beneath the Basin lies a great thickness of soft red and yellow Tertiary sandstones underlaid by Carboniferous coal-bearing formations and limestone. It is these brick-red sandstones which caused von Richthofen to call this region the Red Basin. Under most of the region these rocks are horizontal and undisturbed, but in a number of localities they have been bent into folds so that the coal and limestone have been exposed by erosion. The sandstones contain considerable clay and are easily eroded, while the limestones are more resistant.

Except for the Chengtu Plain, the region is thoroughly hilly. The term "basin" refers to the topographic relations with the high encircling mountains rather than to the nature of the detailed topography. Erosion has so thoroughly dissected the Basin that level land is confined to small areas on the rounded hilltops or flood plains in the valley bottoms. The hilltops are approximately at the same elevation and if connected would form an undulating surface at a height of about 3,000 to 4,000 ft., while the bottoms of the valleys are 1,500 to 2,500 ft. below this upper level. There is a general slope from the north toward the Yangtze. In the eastern half of the Basin are numerous folds trending northeast-southwest which expose the limestone beds and produce a definite series of ridges. Elsewhere the flat-lying and easily eroded nature of the sandstones has permitted the rivers and even the smallest streams to carve the rocks at will.

Rounded hills, commonly covered by luxurious vegetation and cut by deep valleys in which flow turbulent streams, make the land-

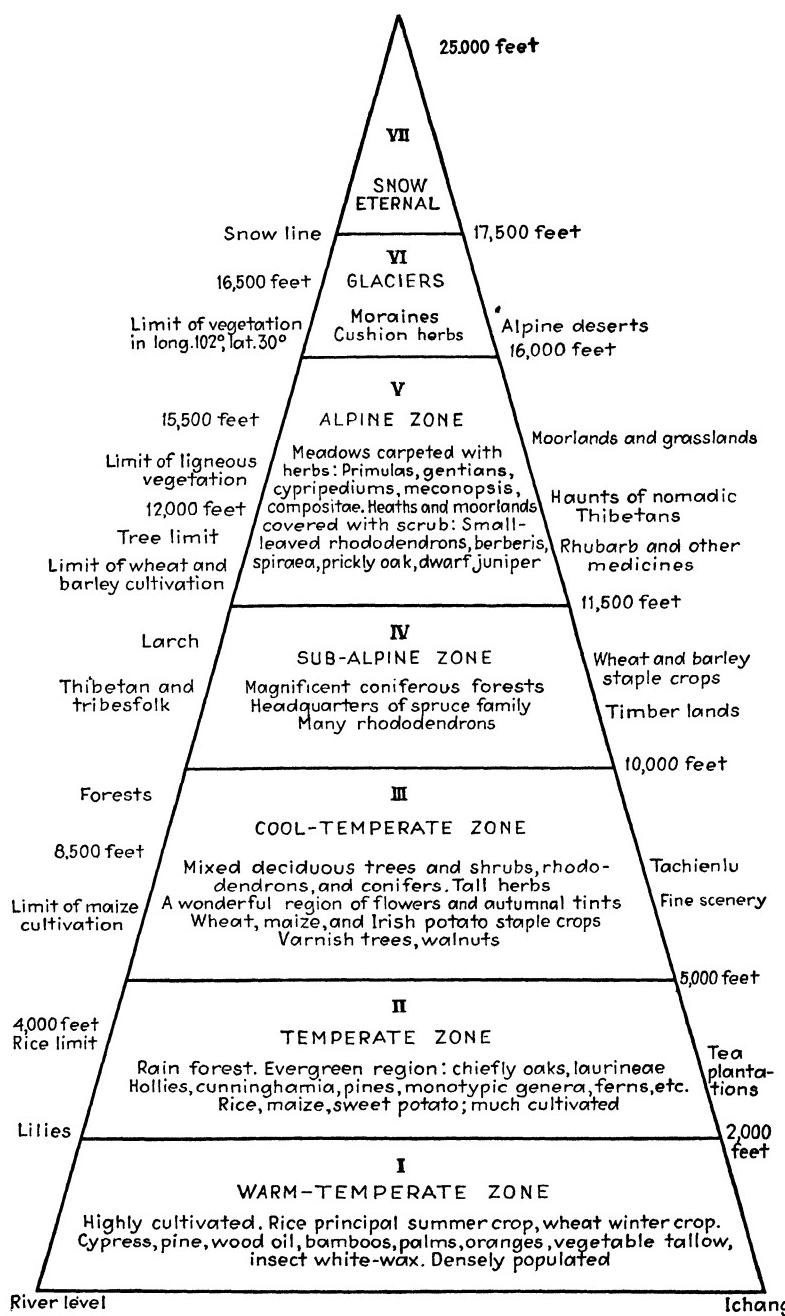


FIG. 153.—Vegetation zones in the Red Basin and Tibetan Borderland. (After E. H. Wilson, "A Naturalist in Western China," courtesy Methuen & Co.)

scape picturesque and varied. This is particularly true in the areas of limestone where the rivers flow in narrow gorges which at times rival in miniature those of the Yangtze below Kweichowfu (Fengkieh). These steep ravines are of no value for agriculture, but the hill slopes are extensively terraced.

The name Szechwan means "four rivers" and refers to the tributaries of the Yangtze which flow southward across the province. From west to east these are the Min Kiang which enters at Suifu, the Chung Kiang, or Lu Ho, which enters at Luchow, and the Suining and Kialing Kiang which unite a short distance above Chungking. Each of these rivers as well as the short southern tributaries of the Yangtze are navigable after a fashion as far as the limits of the Basin, although it requires indefatigable energy to force the small boats up the almost impassable rapids.

The Red Basin is encircled by high barrier ranges which make isolation a distinctive feature of the human geography. The extreme eastern limit of the region is at the city of Kweichowfu on the Yangtze Kiang where the river enters the gorges. Wanhsien farther upstream is sometimes assumed to be the limit but is really well within the area. On the southeast the boundary extends from Kweichow, almost in a straight line, south of and parallel to the Yangtze. South of Chungking the boundary is at Kikiang, while southwest of Suifu the basin extends to Kunlien.

On the west the limits of the Red Basin are somewhat west of Pingshan at the head of navigation on the Yangtze and extend irregularly to the northwest, passing near Kiating to the vicinity of Yachow (Yaan), where there is an extension of the Basin to the southwest. Northwest from Yachow the boundary is clearly marked by the Azure Range through Kwanhsien to the vicinity of Chaohwa. East of this point the margin is parallel to, and somewhat within, the boundary of the province as far as longitude 108°E. where it turns southeast to the city of Kweichow. Except for small portions of the provinces of Hupei and Kweichow, the region thus lies entirely within Szechwan.

The area of the region is 75,418 sq. miles (195,382 sq. km.). The population numbered 43,860,118 in 1926, giving a density of 581 per square mile (224 per square kilometer).

A MILD HUMID CLIMATE

The climate is temperate and moist. Despite the location in the interior of the continent, it is protected from extremes of temperature by the surrounding mountains, and the contrast between summer and

winter is not great. Summer temperatures seldom exceed 38°C. (100°F), while during the winter the thermometer does not usually drop below freezing. Severe frost is uncommon and crops can be grown

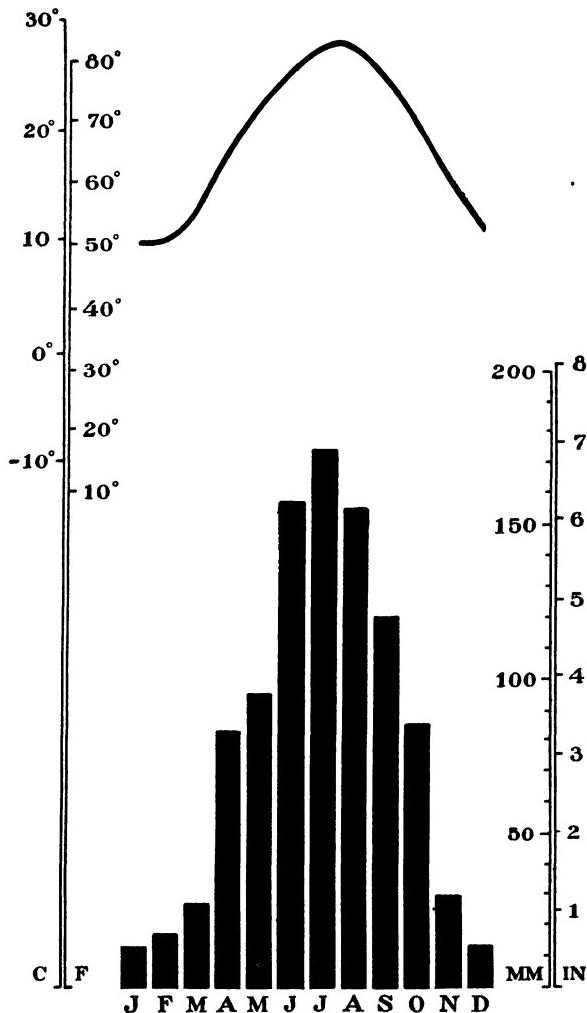


FIG. 154.—Climatic conditions in the Red Basin. Rainfall graph derived from data for Chungking (1,103 mm.), Chengtu (880 mm.), and Anyo (939 mm.). Temperature curve for the same stations.

throughout eleven months. This mild and genial character of the climate applies particularly to the valley of the Yangtze and to the Chengtu Plain. In the north and in the higher elevations the temperatures are somewhat below this figure, and snow is normal.

The humidity is high, especially during the winter months when clouds and mist are common. In some sections of the south the sun is seldom in evidence from December to February. Chungking has a saying that the dogs bark at the sun even as they do at strangers.

The rainfall varies from 900 mm. (35 in.) in the north to 1,100 mm. (45 in.) in the south. Some precipitation occurs at all seasons, but the chief rainy months are June, July, and August. At times the rain falls in torrents and may wash away the terraced rice fields. The rivers rise rapidly after the rains and the summer height of the Yangtze at Chungking is 70 ft. above the winter level.

AGRICULTURAL DEVELOPMENT

The Red Basin occupies an exceptional position among all the regions of China with respect to the character and intensity of its land utilization. Nowhere is there a greater diversity in products than here, and the use which is made of the land would seem to approach the absolute limit under the conditions now prevailing.

In no other section of China is such extensive use made of the hill-sides, indeed, were it not so, cultivation could scarcely be carried on, for level land is largely wanting. Wherever water can be brought by irrigation canals or lifted by various devices, the hills have been laboriously terraced—often up to their summits. These terraces are a monument to Chinese genius and industry and represent in the aggregate an enormous amount of labor.

Where the slope is under 30°, the whole hillside is usually terraced from top to bottom, and only where the slope exceeds 45° is it devoid of agriculture. In some cases even steeper hills may be utilized, and occasional terraced shelves may be seen on slopes which average 60°. In contrast to this, elsewhere in South China all hills with a slope of more than 20° are commonly unused.

Since the slopes are commonly steep, these terraces are but narrow strips of land. They are seldom continuous for more than two or three hundred feet along the level, and yet all are connected by an intricate system of irrigation ditches. As seen from a distance, the effect is of microscopic specks and ribbons of cultivated land. When flooded, the countless paddy fields sparkle in the sunlight like pieces of broken mirrors. Crops are carefully adjusted to the available water supply, so that conditions vary widely between dry upper fields and wet lower fields.

Two crops a year are raised throughout the region, and some farmers grow a third. During the summer, rice is the prevailing crop and is grown wherever the fields can be flooded. It is sown in seed beds

during April or May and transplanted to the fields after the rains have made possible the flooding of the rice fields early in June. As the rains lessen, the grain ripens quickly on the dry fields. The harvest occurs in September and soon afterwards the fields are prepared for the winter crop. The yield of rice depends upon soil and water, averaging 55 bu. per acre.¹



FIG. 155.—Carefully terraced hillsides are found throughout the region. Where water is available, rice is the master crop. (*Paul O. Nyhus.*)

Other summer crops are corn, sugar cane, tobacco, beans of various kinds, sweet and Irish potatoes, a great variety of delicious vegetables, and millet and kaoliang which are raised in the hills where water is not available.

During the winter, wheat is grown extensively and commonly forms the dominant crop. Along with it, in some places assuming greater importance, is rape, which supplies the oil widely used for cooking. Beans and peas are also cultivated. Interculture is carried on intensively, beans often being planted between the rows of wheat.

Opium poppy is raised very widely, both in the more remote districts where it is an easily transported cash crop and also in the

¹ Based upon area and production figures of the Directorate of Statistics.

densely populated areas as well. There have been times of "suppression," but these occasions have usually been used as opportunities of increasing revenue for the succession of militarists who have ruled Szechwan within recent years. In such cases the order forbidding further planting has usually carried a footnote saying that those who did cultivate the poppy should be fined so much per mow, and the local tax gatherers have proceeded to collect the fine whether the opium was raised or not. Opium yields the highest values which can be obtained from a given area of land and hence is the most attractive crop for taxation.

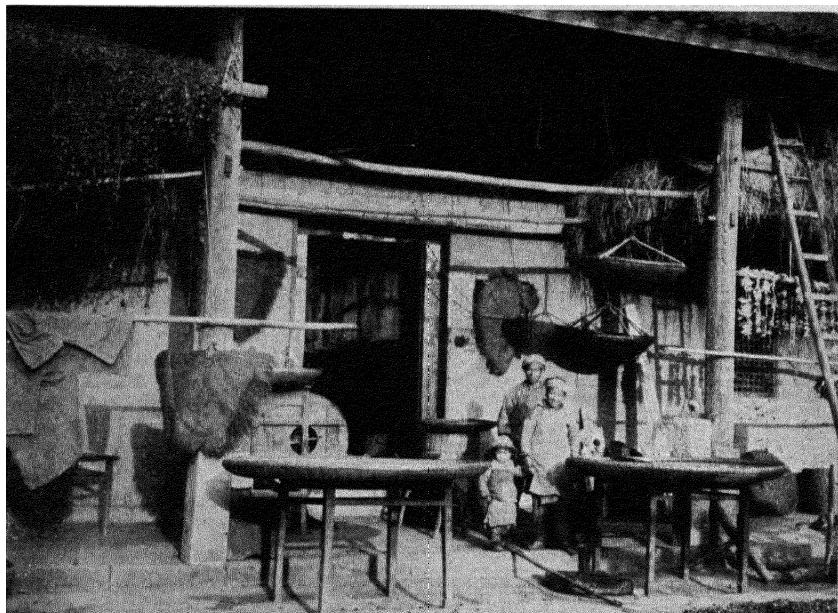


FIG. 156.—A Szechwan farmhouse, with baskets for grain and supplies of straw for the buffalo or for fuel. (*American Museum of Natural History*.)

Cotton is limited to an area northwest of Chungking and most of the requirements of the province are imported from Hupei, this being the chief article in which the Red Basin is not self-sustaining. Silk and tea are produced in large quantities, and the surplus is exported to near-by provinces. The export of tea from Yachow and Kwanhsien supplies most of eastern Tibet and amounts to no less than 40 million pounds annually. There is a large export of wood oil to the United States, extracted from nuts of a tree grown on the rough hillsides.

The reports of the Ministry of Agriculture and Commerce do not supply figures by hsien, but in 1914 the total cultivated area for the entire province was reported as 124,884,906 mow, of which probably 115,000,000 mow lies within the Red Basin. This would amount to 39 per cent of the entire region and would mean an average of 2.6 mow per person. The density per square mile of cultivated land is thus 1,468 per square mile (664 per square kilometer).

TABLE XXIX.—CITIES OF THE RED BASIN

City, all Szechwan	"Christian Occupation of China" (1922)	Maritime Customs (1931)	Other estimates, with source
Chungking (Pahsien)	525,000	635,000	500,000 (Arnold, 1926)
Chengtu.	500,000	.....	700,000 (Arnold, 1926)
Suifu (Ipin).	125,000	.....	150,000 (Shun Pao)
Shunking (Nanchung).	120,000	.....	120,000 (Shun Pao)
Wanhsien.	110,000	210,837	200,000 (Shun Pao)
Fowchow (Fowling).	100,000	.....	100,000 (Shun Pao)
Luchow (Luhsien).	80,000		
Kiating (Loshan).	60,000		

THE CHENG TU PLAIN

The Chengtu Plain is the principal subregion of the Basin and lies in the extreme west next to the Tibetan plateau. Although named from its chief city, it might properly be known by the name of the river which has formed it and to which it owes its prosperity. This plain is a gently sloping alluvial fan spread out by the waters of the Min Kiang as it pours out from the azure wall of the western mountains at Kwanhsien.

The Plain has an average elevation of 1,800 ft. sloping to the south and covers an area of approximately 1,730 sq. miles. The boundaries are quite irregular, but the length from north to south is 70 miles, and the maximum width about 50 miles.

This compact plain contains 15 hsien and the total population is estimated in the Post Office figures for 1926 at 3,722,744. This gives a density of over 2,150 per square mile.

The plain of the Min is one of the loveliest garden spots on earth. Every bit is intensively developed and soil culture has been pressed to the utmost. Nowhere in China, or perhaps nowhere in the world, is there a more fertile, productive, or thickly populated agricultural area of similar size.

This prosperity is due in part to a remarkable series of irrigation canals devised by the great engineer Li Ping and his son 2,100 years ago. At Kwanhsien the summer waters of the Min Kiang are diverted into a series of canals by a temporary dam of boulders contained in bamboo baskets. These irrigation ditches divide and redivide until they spread to all parts of the alluvial fan, thus covering the entire fan each year and accomplishing what the river, if left alone, would do bit by bit during the centuries. This engineer of long ago recognized principles of river control which need to be more widely appreciated.

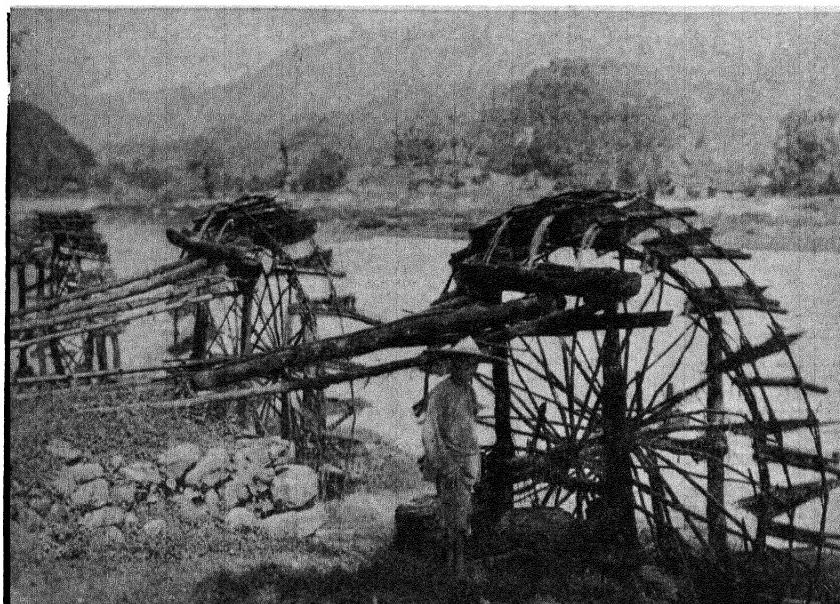


FIG. 157.—Bamboo waterwheels, turned by the current, provide water for irrigating terraced rice fields. (E. H. Wilson, courtesy Arnold Arboretum.)

today. He gave careful instructions that the silt and sand which are brought down from the mountains should be removed from the channels at regular intervals so that disastrous floods might be prevented. In those parts of China where rivers have been confined between dikes and allowed to continue the deposition of silt to such an extent that their channels have become choked, floods have invariably followed. Li Ping's advice is carved deep in the rocks which overlook this diversion dam, *Shen tao tan, ti tso yen*, "Dig the channel deep, keep the dikes low." This advice has been faithfully followed and his memory has been gratefully preserved by one of the finest temples in all China at Kwanhsien.

MINERAL RESOURCES

The province of Szechwan is richly supplied with a variety of natural resources. Coal and iron are widely distributed and the production of salt dates back to a period prior to the Christian era. The mountains to the west are supposed to be rich in metals, but owing to their inaccessibility little is known in detail. This western area has been separated from Szechwan to form the new province of Sikang or Chwanpien, and forms part of the Tibetan Borderland.

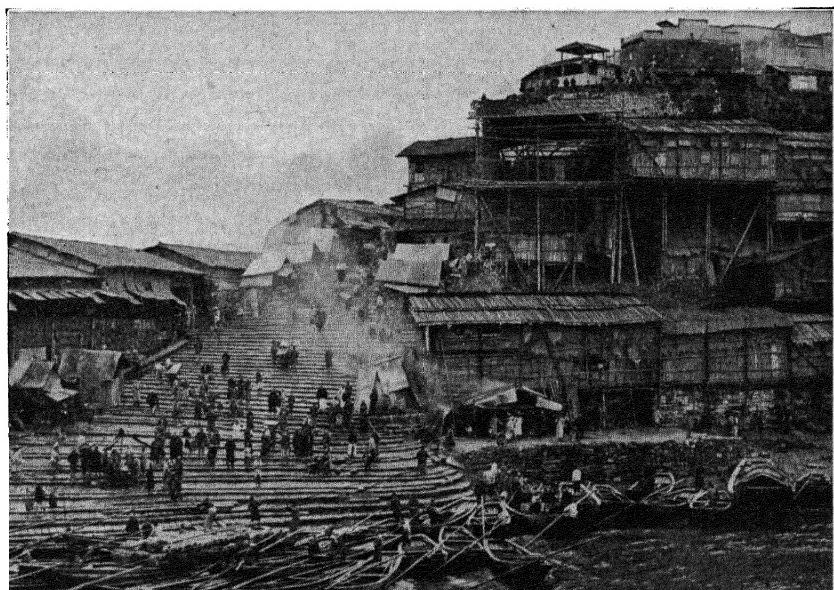


FIG. 158.—A boat landing at Chungking, the commercial center of Szechwan. (*Atto Photographic Association.*)

The Red Basin is underlaid by coal beds which range in composition from lignite in the west to bituminous in the north and anthracite in the east. The average quality is poor. Nine-tenths of it is too deeply buried soon to be of economic importance, and it is only where the rocks have been folded into anticlines and subsequently eroded that the coal is exposed. In such cases it is mined by horizontal galleries running into the hillsides, vertical shafts being seldom used. The methods of mining are very primitive, so that accidents are frequent. The cost of the coal at the mouth of the mine averages 3.00 yuan per ton, but unless a navigable river is near at hand the coal must be carried overland on men's backs so that the price rises rapidly. Over-

land transportation averages 0.15 yuan a ton per mile. At this rate the cost is doubled at a distance of 20 miles, and the ever-recurring transit taxes, or *likin*, still further increase the cost.

The most famous resource of the Red Basin is salt, the preparation of which constitutes one of the greatest industries of the province. The annual production amounts to 300,000 tons. Szechwan supplies its own population and also that of Kweichow as well as large parts of Hupei and Yunnan. The salt is obtained from deep wells in the south central part of the province, the most famous district being at Tze-liutsing. The wells range from 30 to 3,000 ft. in depth and have been dug entirely by native methods.

The wells are drilled by a string of iron tools weighing about 150 lb. which are suspended at the end of a long woven-bamboo cable. In order to pound through the soft rock, the cable is lifted and dropped by the motion of an elastic pole. When the well is finished, brine is lifted to the surface in bamboo tubes drawn up by means of a cable which is wound around a large drum turned by a team of water buffalo. In the deeper wells it may require as long as 15 min. to raise each tube full of brine. Underneath the salt beds are other strata containing natural gas. Sometimes in drilling for salt gas is struck instead. This gas is conducted through bamboo pipes and is used to evaporate the brine; but since the supply is insufficient, most of the brine is boiled down over coal fires.

The presence of natural gas has been assumed by some to mean that petroleum is also present. This does not necessarily follow, and there is yet no evidence that Szechwan will become a large petroleum producer.

TRAVEL IN THE RED BASIN

Szechwan has probably been more hampered by inadequate transportation than by any other single factor. The movement of agricultural and mineral products together with other commerce requires an abnormally large number of people, for means of travel are slow and inefficient. This is true throughout China but is especially pronounced in Szechwan. Animals are rare, carts unknown, railroads but dreams, canals impossible, and the rivers too swift.

Transportation is largely dependent upon man power, either to pull and shove small junks over the rapids, to push squeaking wheelbarrows along bumpy roads deep with ruts, or to carry the burdens of the world on human shoulders. Long lines of coolie carriers laden with salt, tea, or cloth pass along the flagstone trails that wind over the hills. Overland traffic is usually borne on the backs of men, whether

it consists of coal from the many mines, pigs *en route* to market, or pilgrims on their way to the sacred mountain of Omei Shan.

The "roads" are merely narrow trails, paved with slabs of stone about 3 ft. wide. Little attention is given to their upkeep but in many places public-spirited citizens or cities have built stone bridges. The



FIG. 159.—These *bayfoo* or coolie carriers are the pack animals of the Red Basin.
(A. Viola Smith.)

Red Basin is famous for the large number of *pailou*, or memorial arches, which line these roads. Automobile roads radiating from Chengtu and Chungking are revolutionizing passenger service, but railroads are urgently needed.

The rivers of the Red Basin are swift and rocky and it is only by prodigious efforts that boatmen are able to force their shallow junks

through the rapids. Steamboats are in use on the Yangtze which is more easily navigated within Szechwan than in the gorges below the city of Kweichow. In times of high water, small steamers may reach Kiating, but elsewhere flat-bottomed junks and bamboo rafts are the only craft used.

Man is the most economical machine of the Red Basin, and at the same time the cheapest animal. As Beach has said, man is "the universal animal, the omnibus of commerce and the pack mule of the race. It is cheaper to wear men down than to keep roads up. When he falls, few care and still fewer pity, for others are eager to fill his place."¹ Such is the value of human life where mankind permits himself to overcrowd the land. This region offers a magnificent home for a prosperous and progressive people but, like so many of the gifts of nature, there are limits to its capacity; and when the population becomes too dense, man is forced to compete with mere animal power.

¹ BEECH, JOSEPH, The Eden of the Flowery Republic, *National Geographic Magazine*, XXXVIII (1920), 369.

NOTE. Additional views of the Red Basin will be found in Figs. 51 and 60.

CHAPTER XVII

THE SOUTH YANGTZE HILLS

AN AMPHITHEATER OF HILLS

All of southern China below the Yangtze is distinctly hilly or mountainous and forms a superregion which may be called the South China Highlands. While the land forms have a certain similarity throughout, it seems best to divide the area into four regions: the South Yangtze Hills, the Southeastern Coast, the Hills of Liangkwang, and the Southwestern Tableland. Throughout these regions, level land is very limited and there are no broad plains such as characterize the North. This is of great significance with regard to the possibilities of agriculture and the capacity of the country to support a dense and homogeneous population.

The South Yangtze Hills lie in the midst of these mountains and form a transitional region between the Yangtze Plain and the Hills of Liangkwang. The region is a great amphitheater of hills surrounded by higher elevations on all sides except along parts of the northern boundary where there are openings to the Yangtze Plain. There is some rolling country, but for the most part the area is a network of mountains with only limited strips of level land along the rivers. Here and there are open basins floored with softer sediments or river deposits, while gently sloping alluvial fans add to the cultivable area. The hill slopes are usually steep, and in many places the swift streams have cut picturesque gorges to depths of several hundred feet. Although naturally forested, the mountains have been repeatedly cut over so that soil erosion has been severe, with the result that bare rock is prominent.

The average altitudes in the central portions of the region approximate 2,000 ft. Higher elevations are present along the Kwangtung and Fukien borders, as well as in the west, where the mountains rise to twice and three times the foregoing figure. The region as a whole is lower and the slopes are somewhat gentler than elsewhere in the South China Highlands. As a result, the proportion of level land is greater than in the other regions south of the Yangtze and amounts to some 15 per cent of the region.

Two mountains of special interest are the Lu Shan near Kiukiang and the Hung Shan in central Hunan, both having an elevation of about 4,000 ft. The former is the site of the summer resort of Kuling, while the other is one of China's many sacred mountains.



FIG. 160.—Quiet temples and ancestral halls are a picturesque part of the landscape.
(*Asia Photographic Association*.)

The chief rivers are the Siang Kiang and Yuan Kiang in Hunan, the Kan Kiang in Kiangsi, and the Chientang Kiang in Chekiang. These main streams, as well as their tributaries, are swift and contain many rapids. Both hydrographic drainage and commercial flow are toward the Yangtze Plain.

The boundaries of the South Yangtze Hills are less clearly delimited than is the case with other geographic areas. Owing to the generally mountainous nature of all South China this condition is inevitable, and the limits are gradational. The region covers parts of Hunan, Kiangsi, Anhwei, and Chekiang. The northern limit is the margin of the Yangtze lowland and is well defined although very irregular. The level land surrounding the Tungting Hu in Hunan and around the Poyang Hu in Kiangsi belongs with the Yangtze Plain rather than with the Hills. Isolated hills occur among the lowlands, both along the Yangtze itself as well as near the lake basins, while level land follows up many of the valleys well within the region.

To the south and east are mountain ranges which mark the watershed between the Yangtze and the various coastal streams. For the most part these are not single conspicuous ranges but instead irregular elevations. Those on the south, along the borders of Kwangtung and

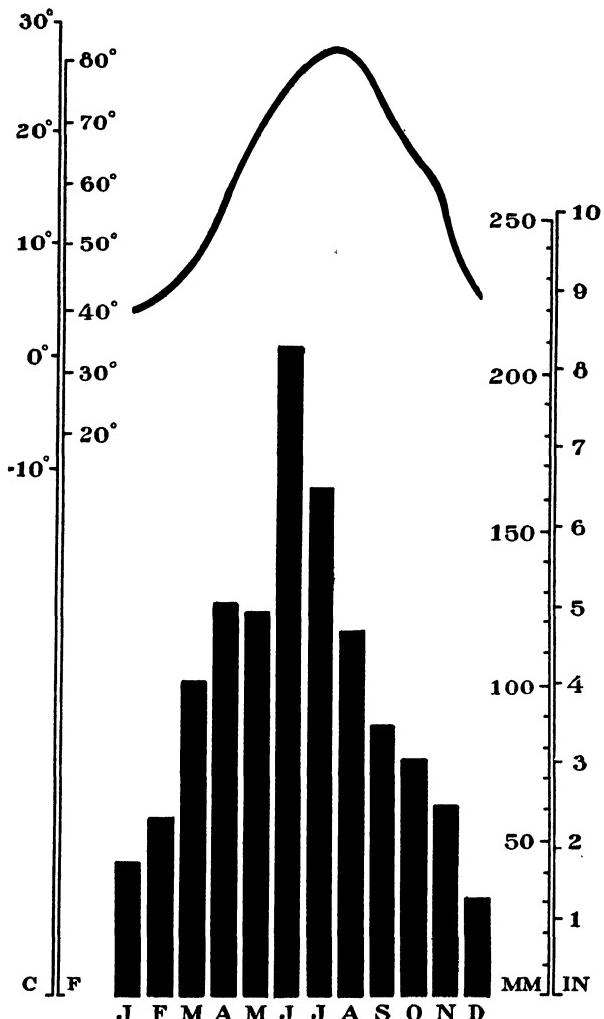


FIG. 161.—Climatic conditions in the South Yangtze Hills, based on Changsha (1,412 mm.).

Kwangsi, are the Nan Shan, or Nanling. The eastern limits follow the Tayuling and Wuyi Shan, or Bohea Hills, along the boundary between Kiangsi and Fukien. In Chekiang the Hills include the valley of the Chientang Kiang and extend eastward to near Ningpo.

On the west the elevations gradually become higher and higher, and conditions of topography and human adjustment merge with those of the Southwestern Tableland. In the absence of a marked break, a transitional boundary is drawn along the line of the Hunan Kweichow border. The South Yangtze Hills are off the main lines of modern travel and little is known of the detailed physiography. Despite the poorly defined limits, the region seems to possess a real geographic unity.

The area is 155,428 sq. miles (402,633 sq. km.).

CLIMATIC CONDITIONS

This region is temperate rather than subtropical. The summer temperatures are high, as is to be expected in this latitude, but the winters are cool. The heat of the summer is largely a result of solar insolation, while the winter chill results from cold north winds. The South Yangtze Hills are sufficiently removed from the ocean to be free from typhoon influences. The summer maximum is at least 95°F. (35°C.), while the lowest temperatures during the winter may be below 20°F. (-7°C.).

The rainfall is abundant at all seasons except the winter. Spring and early summer have the highest precipitation, with 6 in. in March and 9 in. in June, after which the amount falls to 5 in. in July and August. The total amounts to 1,400 mm. (55 in.). Snow is uncommon but occasionally falls on the higher peaks. The heavy summer precipitation causes the humidity to be excessively high.

THE HUMAN RESPONSE

Human activities are restricted to the valley bottoms, where the population is concentrated in strips on either side of the stream. Many villages are elongated with one or two main streets parallel with the stream or highway. Owing to the premium on level land and the apparent desire of the southern Chinese to crowd together as closely as possible, the streets are narrow, often being no more than ten feet wide. Along these streets all is teeming activity. Coolies slop water which they are bringing up from the stream, wandering merchants with wares suspended from the ends of shoulder poles shout their business, jostling throngs press around to hear a storyteller and give way good-naturedly to a sedan chair, a drove of pigs, or whatever traffic needs most of the narrow street.

The concentration of the people in the valleys causes economic developments to follow the main rivers and extend up their tributaries. Detailed maps of population densities and economic interest would thus show a treelike pattern, but without leaves, for the hilly areas

are practically uninhabited. The absence of easy communication has caused each section to lead a more or less detached existence, ignorant of the outside world and even of near-by villages. Archibald Little has referred to this fact by saying that certain hsien have dialects as distinctive as the flavor of the tea which they produce.



FIG. 162. Bamboo rafts provide the only means of navigation on the shallower streams.
(*Ato Photographic Association.*)

This region was severely devastated by the Taiping Rebellion in the 1860's when millions were killed or died of starvation. The region took many years to recover and even now ruins of old cities may still be seen. At the opening of the present century, the still relatively low density of the population brought correspondingly high per capita returns, so that the region was fairly prosperous. The natural fecundity of the Chinese has now built up the population to such a point that the agricultural production for each person is small and there is danger of famine if crops fall slightly below the average. Such conditions have occurred several times since 1920, providing an example of famine due directly to normal population increase rather than to any catastrophe of nature.

This is a region of primary production or simple industry rather than of manufacturing or commerce. Mechanical industry is poorly developed and the use of modern machinery is limited to a few of the larger mining enterprises and electric lights in some of the cities.

The condition of native industry may be illustrated by the common straw sandals worn by all coolies who do not go barefoot. These sandals are woven from rice straw and seldom last more than three or four days, so that the consumption reaches imposing figures. The raw material is everywhere available and has little use except to be burned. These shoes are made by farm women in their spare moments and represent their only opportunity of picking up a little extra money. Since every housewife is very anxious for the additional income, ruinous competition has pushed the retail price down to three or four coppers a pair, only a part of which reaches the producer. Such a price does not give a fair wage and is merely a reflection of the low standards. Harry Franck has well observed that "overcrowded China resembles air in its haste to fill a vacuum."

TABLE XXX.—CITIES OF THE SOUTH YANGTZE HILLS

City and province	"Christian Occupation of China" (1922)	Other estimates
Changsha, Hunan.....	229,537	606,972 (Customs, 1931)
Kanchow (Kanhien), Kiangsi	200,000	
Siangtan, Hunan.....	180,000	300,000 (Arnold, 1926)
Changteh, Hunan.....	180,000	300,000 (Arnold, 1926)
Kian, Kiangsi.....	120,000	
Fuchow, Kiangsi.....	100,000	
Hengchow (Henghsien), Human	100,000	

The most famous industry is the manufacture of porcelain, carried on at Kingtehchen in Kiangsi and Liling in Hunan. Kingtehchen has been famous for the manufacture of beautiful porcelain for centuries, the first recorded production being in 583 A.D. when gifts were sent to the Emperor. Prior to the Taiping Rebellion the quality of the ware was much better than today. There are now 125 kilns producing from 4 to 5 million pieces a year, but the larger part of the production consists of common articles such as rice bowls and simple vases. There are about two thousand potteries in the city, most of which are family enterprises. The raw material is kaolin, the name being derived from the Chinese words *kao ling* meaning "high ridge," indicating a near-by locality where the clay is obtained. Samples of the ware for which Kingtehchen is famous are given honored places in museums throughout the world.

Many of the commercial centers serving the South Yangtze Hills lie outside the region in the Yangtze Plain. These include such cities as Hangchow, Nanchang, Kiukiang, and other ports along the Yangtze toward which the economic life of the region naturally gravitates.

The chief cities within the South Yangtze Hills are indicated in Table XXX.

The total population numbers 65,452,369, giving a density of 421 per square mile (162 per square kilometer).

VALLEY-BOTTOM AGRICULTURE

The South Yangtze Hills produce all of the usual agricultural products of South China. Rice is grown during the summer on all lowlands which can be flooded, but the limited rainfall of the late summer seldom makes it possible to secure more than one harvest. Sweet potatoes are important on drier fields. Winter crops commonly consist of beans, oil seeds, and wheat. Variations in the available water supply introduce different cropping systems. Under favorable conditions there is a small surplus of rice for export to the Yangtze Plain. The chief cash crop of the region is tea, of which the Hills produce the largest quantity in China. Oranges are the principal fruit. Where animals are used on the farms they are the ponderous water buffalo.

Agriculture is restricted to the valley bottoms and terraced alluvial slopes. Most hillsides are uncultivated. The Hunanese describe their province as containing three-tenths mountains, six-tenths water and one-tenth plain. Since the Tungting Basin belongs with the Yangtze Plain, a more accurate description for the part within the South Yangtze Hills would be eight-tenths mountains, one-tenth water, and one-tenth plain.

The limited extent of slope utilization is characteristic of South China with the exception of the Red Basin. For the most part the hillsides are a wilderness, covered with natural vegetation from top to bottom, except where the hand of man has recently been at work. Since the valley floors are densely inhabited and used to the utmost, it is surprising that the hills are not utilized for grazing or for raising fruits and nuts. This condition can scarcely be due to the lack of the necessary labor or to the absence of pressure for additional food, nor is it likely to be on account of insufficient rainfall. It may be that the limited terracing and slope utilization are related to the poorness of the soil due to severe and continued erosion following the repeated cutting of the vegetation.

The cultivated land amounts to 112,063,489 mow (18,677,248 acres). This is 19 per cent of the total area and represents an average

of 1.7 mow for every man, woman, and child. If cultivated land alone is considered, the average density of population supported by each square mile amounts to 2,244 people.

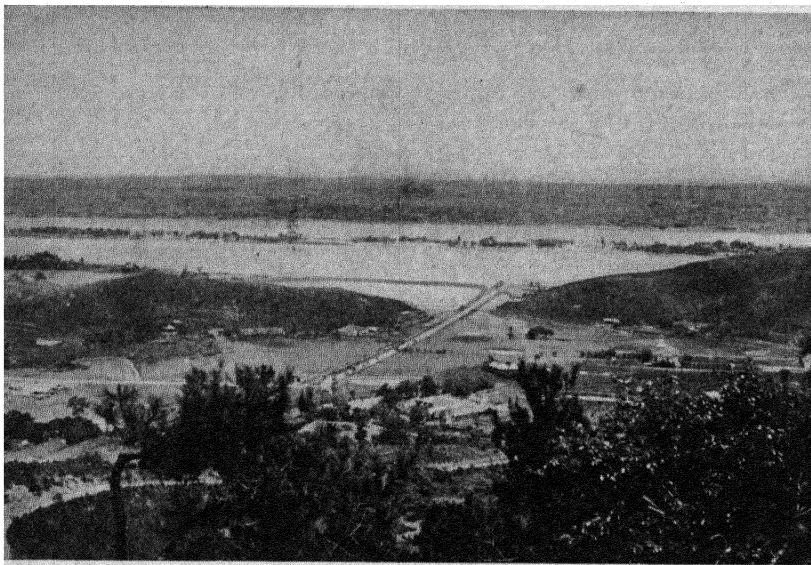


FIG. 163.—An island in the Siang gives the name to Changsha, the city of the “long sand.” (*Asia Photographic Association.*)

TEA

China has long been famous as a producer of tea, the first shipment to Europe having been made in the seventeenth century. The present annual production of the entire country is estimated at 6,500,000 piculs (195,000 metric tons), of which 95 per cent is produced in the provinces of central and southern China between latitude 24° and 32°N. The total area devoted to tea culture is estimated to be 5,500,000 mow, of which two-thirds is within the South Yangtze Hills. There are no large plantations and the tea is grown in small scattered patches, usually on dry sunny hillsides. The leaves are picked three times a year, in April before the spring rains, during the month of May, and in August or September. The first picking is the best. This region produces the finest quality of tea and is followed in order by the Southeastern Coast, the Hills of Liangkwang, and the Red Basin. China formerly supplied all the tea of the world but within the past century the export trade has greatly declined, owing to the competition of Ceylon and Assam and the failure to maintain the quality

of Chinese tea. The production of black tea is about three times that of the green variety, the difference being largely a matter of curing.

The most important tea district of the region is in central Hunan in the vicinity of Siangtan, the city of Anhwa having the reputation of producing the finest leaf. The Hunan tea is shipped through Hankow where great quantities are pressed into bricks for the Russian and Mongolian trade. Kiangsi is also an important producer, its product being exported through Kiukiang. Both these provinces produce chiefly black tea, the green varieties being grown in the eastern part of the South Yangtze Hills, south and west of Hangchow, and in Fukien. Certain varieties of Chinese tea are highly prized and are worth as much as 40 yuan a pound. During the days of the clipper ships, the foreign trade was centered in Foochow. Later on, Hankow became the chief port, but at present Shanghai leads.

The following quotations from Torgasheff indicate some of the problems which must be faced if China is to regain her importance in the tea trade of the world.¹

"Backward methods of cultivation, scattered holdings, lack of systematic planting, absence of capital in the hands of the farmers, complete lack of knowledge as to how to maintain the quality of teas in less favored years, unwillingness to improve quality—all this has contributed to the rapid disintegration of the tea trade in China, making it give way before the competition of other tea markets.

"The extension of the plantation system and the introduction of machinery for the preparation of the leaf are the foremost problems before the Chinese tea industry."

The decline of China's export may be seen in the following statistics, also from Torgasheff. All quantities are in millions of pounds.

Year	World exports	India	Ceylon	China	China's share, per cent
1896	542	150	110	228	42
1925	824	360	210	89	11

NATURAL RESOURCES

The natural resources of the region are varied and extensive. The people of Hunan have been engaged in mining since the days of

¹ TORGBSHEFF, BORIS P., "China as a Tea Producer."

the Chou dynasty (1122 to 255 B.C.), but the extent of the mineral wealth has not yet been determined. The resources of Kiangsi, southern Anhwei, and Chekiang are imperfectly known but appear to be somewhat inferior to those of Hunan. Modern methods are used in the mining of some coal and for lead and zinc, but most deposits are still worked by primitive methods without attempt at systematic exploitation.



FIG. 164.—The Siang Kiang is the principal river of Hunan, with thousands of boats such as these in constant use. (*Asia Photographic Association.*)

The leading resource is coal, which is found in many districts. The largest mine is at Pinghsiang, southeast from Changsha and just across the border in Kiangsi, but the production has been negligible since 1925. The major part of the output of this mine was converted to coke and shipped to the iron furnaces at Hanyang or Tayeh, on the Yangtze. Pinghsiang was the largest and most modern producer in South China, and the value of its output was equal to the total of all mineral products in the region put together. Excellent iron ore is present at Tayeh in Hupei and in Anhwei.

The most distinctive resources of the region are antimony, the chief deposit of which is located at Hsikwangshan in central Hunan, and tungsten, secured in southern Kiangsi. Next in importance come

zinc and lead, with an important producing area at Shuikoushan south of Hengchow in Hunan, where modern mining has been carried on by the government for many years.

The South Yangtze Hills are an important producer of timber. Forests at one time covered all the region but have now been cut in the vicinity of the rivers, so that logs must be carried a considerable distance on the shoulders of men. There is a large export to the cities of the Yangtze Valley. Huge rafts are floated down Yuan Kiang in Hunan. The principal trees are pine, oak, camphor, and fir, and large quantities of bamboo are also produced. Despite the widespread deposits of coal, brush and straw form the chief fuel. Long lines of people, often women and children, may be seen coming down from the hills laden with bundles of brush and branches.

CHAPTER XVIII

THE SOUTHEASTERN COAST

SEA CLIFFS, VALLEYS, AND DELTAS

Southeastern China is bordered by a rocky and irregular shore line backed by picturesque mountains. Maritime activities dominate the coastal fringe and give this region more contact with the sea than any other in China.

The embayed coast line of southeastern China resembles in its intricacy the shore lines of Japan or New England. Rocky promontories abound and alternate with small sandy coves. There are numerous islands, some of which are several miles in extent, such as in the Chusan Archipelago in the north, while others range in size down to mere points of rock. These half-buried hills give evidence that during recent geologic time this area has slowly been sinking.

Such a coast line affords shelter in time of storm but at the same time has been the cause of many disasters to shipping, despite the fact that it is well marked by lighthouses established by the Chinese Maritime Customs. Numerous excellent harbors are present behind the protecting islands or within the sheltered bays. Most of these natural harbors have poor connections with the hinterland and so have never attained the importance of commercial ports, which have only developed where river valleys give access to the interior. These river mouths are usually shallow and provide inferior harbor facilities.

The rugged topography of the coastal margin continues inland to the high ranges which mark western limits of the region. Hills and low mountains form the characteristic features of the physical landscape. In general, there is a distinct structural and topographic trend from northeast to southwest. This alignment parallels the coast and represents the axis of rock folds and igneous intrusions associated with ancient earth movements. The mountains of the Southeastern Coast were once much higher than at present, for the ranges of today are but the remnants or eroded roots of old mountain chains, the major part of which have long since been carried away. Granite and porphyry are abundant, with scattered patches of young soft rocks in protected areas.

The elevations of the ridge summits above the valley bottoms are commonly from 1,500 to 2,500 ft., and the summits usually average about 3,000 ft. above sea level. Higher elevations are found along the western border of Fukien and between this province and Chekiang, the highest peaks rising to 6,000 ft.

There is no dominant chain of mountains. The best marked ranges are along the boundary between Fukien and Kiangsi. These are given a variety of names on various maps, none of which are applicable throughout their length. Tayuling or Taching Shan is commonly accepted for the southern section, while Wuyi Shan or the Bohea Hills may be used for the northern portion.

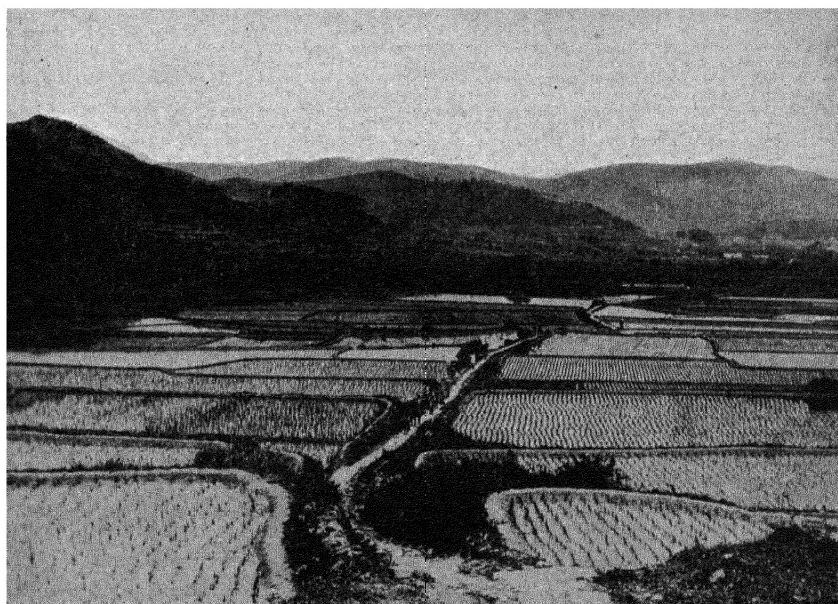


FIG. 165.—Rice fields and flagstone trails amid the mountains of Fukien. (*The Photo Bureau.*)

The rivers of the Southeastern Coast are short and swift, making navigation very difficult even for small native craft. The main streams flow directly to the coast, cutting through the transverse ridges. Where the rivers cross the higher ranges, the valleys become canyons with narrow defiles and rocky beds, while in the more open intermountain areas there are open stretches with quiet water and more gentle hill slopes. The tributaries commonly flow in the northeast to southwest structural depressions and join the main streams at right angles. The

result is that the valleys of the tributaries are often wider and contain more level land than those of the main rivers which must cut across the grain of the country.

The Min Kiang is the chief of these rivers and empties into the sea below Foochow. Its course is a succession of picturesque gorges and treacherous rapids, strewn with huge boulders. Whirlpools and foaming rapids make navigation difficult as well as dangerous, and it is only by considerable skill and much effort that boats can operate. The scenery is exceptionally beautiful, and the picturesque temples which crown the pine-clad hills have furnished the inspiration for many famous scenes in Chinese painting.



FIG. 166.—Foochow at the mouth of the Min Kiang. Boats such as these in the foreground form the only homes for thousands. (*Asia Photographic Association.*)

The river is about three hundred miles in length, and there is a considerable volume of trade carried on by means of frail boats and rafts. At its mouth the river has built a small delta on which lies the densely inhabited city of Foochow, so crowded that thousands of people live on boats rather than on the land. The boats are packed together in row after row and one can scarcely tell where land ends and water begins. The delta is of limited extent but very intensively cultivated.

The harbor of Foochow is poor and used only because the Min is the natural gateway to interior Fukien and western Kiangsi. Steamships are obliged to anchor at Pagoda Anchorage 9 miles below the city and even here there are no adequate wharfs or piers. Sand bars at the mouth keep out large ocean vessels, and only small coastwise steamers can reach Pagoda Anchorage. In the days of the Yankee clippers and the tea trade, the port was more important than at present.

The various rivers of the Southeastern Coast divide the region into distinct economic subareas, isolated from each other except by sea, and each dominated by a river-mouth city. From north to south these ports are Wenchow at the mouth of the Wu Kiang, Foochow at the mouth of the Min, Amoy at the entrance to the Lung Kiang, and Swatow near the mouth of the Han Kiang. Each of these streams resembles the Min in its rocky character, and in every case the city lies on flat delta land built up by the river. Amoy and Swatow have very good harbors. The largest of these plains is that around Swatow, Chaoyang, and Chaochow with an area of approximately six hundred square miles. Aside from the deltas, flat land is limited to open valleys or alluvial fans among the mountains with a width seldom over five miles.

The Southeastern Coast extends from the Chusan Islands near Ningpo in northeastern Chekiang southwest past Tientai to the border of Fukien and Kiangsi. Southward it follows along the western boundary of Fukien and includes the eastern end of Kwangtung, reaching the sea just west of Hweilei, midway between Swatow and Hongkong. The area covers 70,909 sq. miles (183,703 sq. km.), so that this is one of the smaller of the geographic regions. The length is 640 miles, and the maximum width does not exceed 190 miles.

MAN'S RESPONSE TO THE OCEAN

Fishing is the most distinctive occupation along the coastal fringe of this region. Wherever people live along an irregular and inhospitable shore, they tend to turn seaward. The Southeastern Coast is overcrowded with a population which cannot produce sufficient agricultural products for its own needs, and this fact, combined with the presence of innumerable protected coves and abundant resources of timber, gives maritime interests an important place in the life of the region.

This is the most important fishing area of the China coast, and the industry is best developed in the Chusan Archipelago. Thousands of small junks go out into the open sea, and the near-shore waters are worked for oysters, shrimps, and prawns. The fishing vessels are the old Chinese type, with high poop and stern and picturesque

sails. These boats are not usually absent from port more than two or three days at a time. The total value of the fish and other marine products of this region in 1920 was reported by government agencies to be over 3,500,000 yuan, but this cannot be regarded as the total amount. Ningpo is especially famous for the preparation of dried and salted fish which are exported to all sections of China. Sea foods occupy a large place in Chinese diet, and no feast is really complete without a dish of savory fish and such delicacies as shark's fins, slugs, and edible seaweeds.

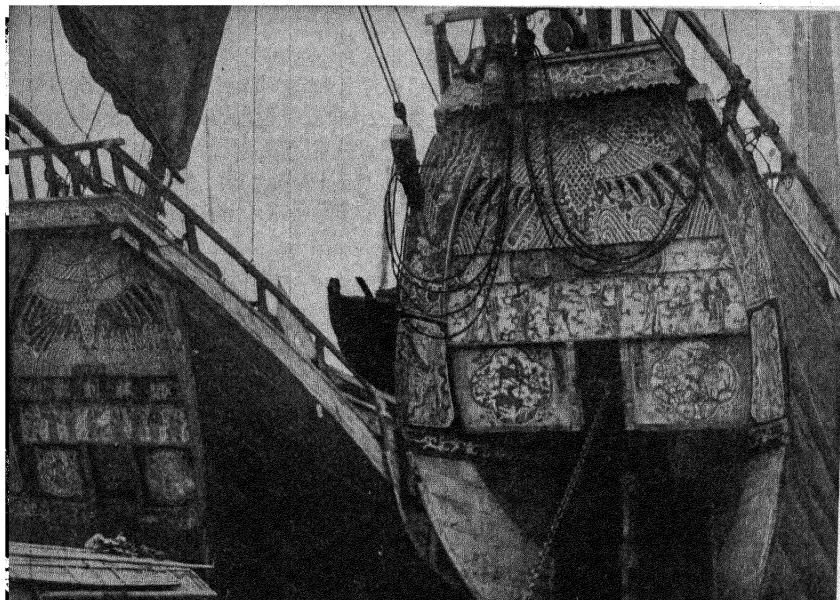


FIG. 167.—The sea-going junks of various ports each have their distinctive gaily colored design. (*Asia Photographic Association.*)

Fisheries are the schools of seamanship, so that it is but natural to find commercial as well as fishing interests in this area. Large ocean-going junks are extensively used between the various ports of the region and are employed for carrying timbers and produce all along the China coast. Despite the introduction of steamships, these relics of the middle ages still hold their own. Their modern rivals are manned by the same seafaring peoples, for this region furnishes the crews for practically all of the coastal steamers. The contact with the boundless ocean has given a wider outlook to the peoples of the Southeastern Coast, and they have gone out to the Malay Peninsula, Indo-China, and the East Indies by the million.

During a voyage from Shanghai to Hongkong, the traveler is seldom out of sight of tiny fishing boats, bobbing up and down on the waves in a manner which is quite deceptive of their seaworthy qualities. Each section of the coast has its characteristic style of gaily decorated boat, so that experienced ship captains are often able to chart their position during foggy weather from these ever-present craft. This situation is quite unlike the North China coast where the land is generally flat and the straight shore line furnishes few good harbors. On a trip by water from Shanghai to Tientsin scarcely a

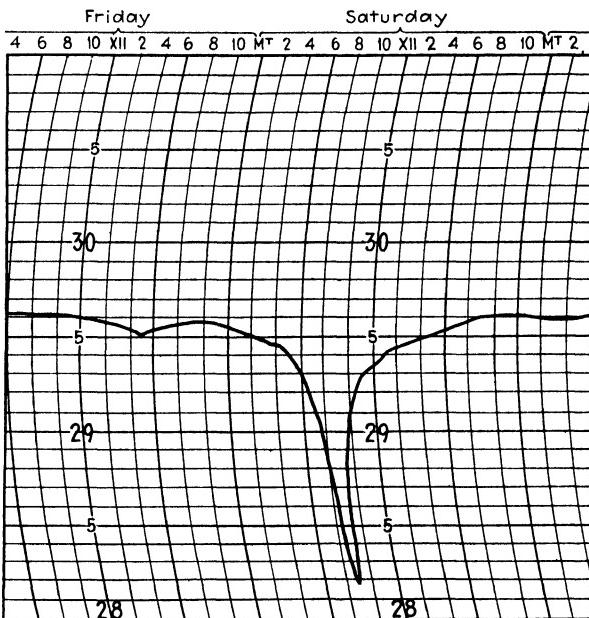


FIG. 168.—Barograph record of the Hongkong typhoon of Aug. 18, 1923, recorded at Taikoo House, elevation 1,400 ft. Wind velocity 130 miles per hour.

fishing boat will be seen; and if a few are met, it will be around the rocky promontory of Shantung. The absence of forests in the North seriously handicaps shipbuilding, while broad plains and indefinite muddy shores are not conducive to a marine interest.

A WARM WET CLIMATE

The Southeastern Coast has a subtropical climate with the heaviest rainfall in the entire country. Snow is all but unknown, except on the highest mountains. From February to September there are at least 3 in. of rain each month, with a maximum of 9 in. in June. The lines

of equal rainfall are parallel to the coast, and the precipitation increases rapidly inland with the maximum occurring in the mountains along the western border. Near the sea the amount averages 1,500 mm.

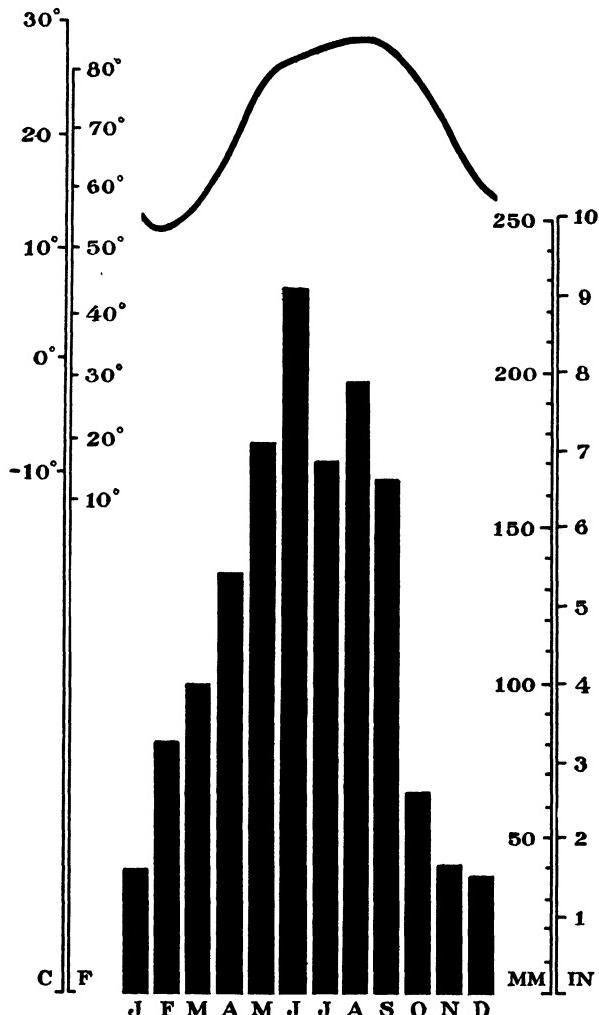


FIG. 169.—Climatic conditions in the southeastern coast. Rainfall curve derived from data for Wenchow (1,689 mm.), Foochow (1,435 mm.), Amoy (1,183 mm.), and Swatow (1,516 mm.). Temperatures for the same stations.

(60 in.), while in the mountains, especially those toward the south, the maximum exceeds 1,800 mm. (72 in.).

The Southeastern Coast is especially exposed to typhoons, and there have been many disasters to ships and coastal cities. Fortunately

the severity of the storms greatly diminishes as they pass over the land. Typhoons occur most commonly from July to September and are rare from January to April. As much as 100 mm. (4 in.) of rain may fall in a single day. It is the occurrence of these typhoon rains which brings so much precipitation during the late summer and fall, in contrast to the spring and early summer rains of the South Yangtze Hills.

The temperatures are mild throughout the year. The nearness to the sea moderates the heat of summer, while the mountains shield the region from the northwest winds of winter. Summer temperatures seldom exceed 35°C. (95°F.) except in the deltas, and the day and night average is about 30°C. (85°F.). The mountains are cooler but do not rise to a sufficient height to escape the enervating warmth and humidity which characterize summers throughout the region. This high humidity is splendid for the growth of vegetation but is not so good for man. Europeans often find it difficult to retain their health and vigor under such conditions.

During the winter, the temperature rarely drops to freezing, and the January average is 7°C. (45°F.) in the north and 13°C. (55°F.) in the south. These figures apply to the coast and to the settled river valleys rather than to the mountains.

RESTRICTED AGRICULTURE

The use of the land for agricultural purposes is severely restricted by the mountainous character of the landscape. Level land does not exceed 5 or 10 per cent of the area and is mostly confined to the deltas. Some of the lower and more gentle slopes are terraced, but these are usually areas of alluvium or softer rocks. Many hill slopes are steep and have only a thin soil cover. It is doubtful whether any additional areas can be brought under cultivation, for, with the overcrowded character of the region and the necessity for importing rice, such types of land utilization as depend upon human labor have already been pushed to their economic limit.

Where conditions of soil and topography permit, cultivation is carried on with great success. Rainfall and temperatures permit crops to grow throughout the year. Intensive cultivation is the rule and is painstakingly carried on by hard-working farmers and their families.

Not all of the arable land is available for rice culture; but wherever the soil is not too sandy and water can be secured for irrigation, it forms the dominant crop. Two crops of rice are commonly grown each year, except in the inland districts where the typhoon rains of the late summer are less heavy. The first is planted in April and harvested in July, while the second is set out after the first harvest or planted

between the rows of the first crop in June and harvested in October. Allowing for this double cropping, rice occupies 60 per cent of the total crop area. Production figures vary considerably according to the amount of water available, but in one area in Fukien, Buck found a yield for the early and late rice crops combined of 162 bu. per acre.¹ The entire crop is consumed locally and is insufficient to meet the requirements, so that large quantities are imported from Indo-China and the Yangtze Valley.

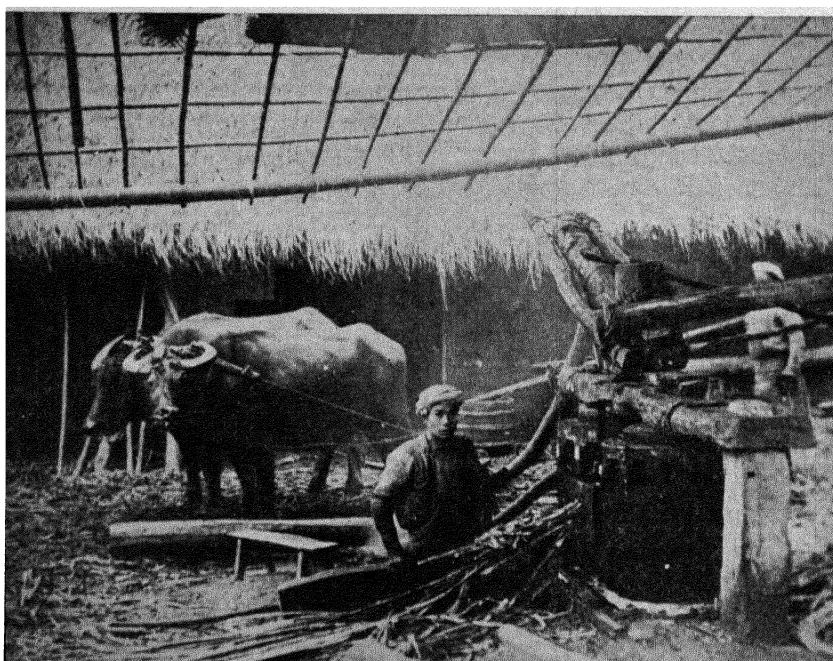


FIG. 170.—Sugar cane is crushed in crude mills turned by water buffalo. (*The Photo Bureau.*)

Sweet potatoes occupy an important place in the diet of the poorer people and great quantities are raised, especially on sandy soil and hill slopes which are unsuitable for rice. In some places they follow the first crop of rice. This is the most important region in China for this crop, although raised in every part of the country.

Following the harvesting of the second crop of rice, the land is planted to winter crops, of which wheat is the most important with beans, rape-seed, and vegetables next in order.

¹ BUCK, J. LOSSING, "Chinese Farm Economy," 204.

Other products of importance are bamboo shoots, sugar cane, vegetables, peanuts, tobacco in south Fukien, and fruit. Amoy is famous for pomelos, a citrus fruit resembling grapefruit, and Swatow exports large quantities of delicious loose-skinned tangerines or Mandarin oranges, famous throughout China for their sweetness.

In addition to the foregoing food crops, this region is renowned for its tea, grown especially in the Wuyi Shan, or Bohea Hills, of western Fukien and shipped through Foochow. At one time there was a large export to Russia and England, but at present the trade has greatly declined. Foochow teas are still regarded as being among the best in the world, but they have become too expensive for the trade.

THE PEOPLE

The people of this region represent a great racial mixture, the product of repeated migrations and much local isolation. No other region in China except the Southwestern Tableland has such a confusion of races and dialects. Until two thousand years ago, the country was largely inhabited by non-Chinese tribes, some of whom still remain in the more inaccessible sections where they have been pushed by the newcomers from the north and west. Whereas the level land of the North China Plain has been a melting pot, these mountains have served to perpetuate and accentuate racial variations. As a result, the people are clannish and speak a multitude of dialects, more than 108 varieties being reported in Fukien alone.

Large numbers of people have gone from this region to settle in the South Seas, where many have become wealthy. This emigration does not have the spectacular character of the movements to Manchuria but has been going on steadily for a century, so that the number of overseas Chinese who have gone from this region amounts to several million. People from Fukien and Kwangtung constitute the great bulk of Chinese abroad and the fact that many of them have sent back large sums of money to relatives or for investment has greatly aided the prosperity of these provinces. Arnold estimates that the remittances received in Amoy alone amount to over 40,000,000 yuan annually, thus constituting one of the principal sources of wealth.¹

These people have gone to Indo-China, the Straits Settlements, Netherland India, chiefly Java, and the Philippine Islands. In each case they represent the penetration of a people who are superior to the natives. As a result, they occupy a favorable position and, instead of continuing to be mere laborers, many of them rise to places of economic advantage. In many parts of the foregoing areas the Chinese

¹ ARNOLD, JULEAN, *China, a Commercial and Industrial Handbook*, " 555.

almost monopolize the small retail trade and have a considerable share of the larger business as well.

The total population of the region amounts to 29,585,155 giving an average of 417 per square mile (161 per square kilometer). Most of the important cities are located along the seacoast and estimates of their population are shown in Table XXXI.

TABLE XXXI.—CITIES OF THE SOUTHEASTERN COAST

City and province	"Christian Occupation of China" (1922)	Maritime Customs (1931)	Arnold, "Commercial Handbook" (1926)
Foochow (Minhow), Fukien.....	625,000	322,725	700,000
Chuanchow (Tsinkiang), Fukien.....	130,000	.....	75,000
Amoy (Szeming), Fukien.....	114,000	234,159	260,000
Wenchow (Yungkia), Chekiang.....	140,000	631,276	100,000
Swatow, Kwangtung.....	80,000	178,636	100,000
Chaochow (Chaoan), Kwangtung.....	250,000	.....	300,000
Chaoyang, Kwangtung.....	100,000	.....	250,000

THE HAKKAS, AN EXAMPLE OF SELECTION BY MIGRATION

One of the most interesting racial groups in this region are the Hakkas or "guest people" who live in Fukien and Kwangtung. They are a mountain folk who are regarded by some as aborigines or barbarians, but who are really as Chinese as their neighbors. As a matter of fact, the Hakkas are some of the early arrivals and drove out the real aborigines, the Miao and the Yao. The historical records make it clear that the Hakkas originally lived in Honan and Shantung and migrated from there during the fourth and ninth centuries because of Tartar invasions. Their migrations southward were thus prompted by a desire to escape alien oppression and to find new and better homes. After a series of moves the Hakkas came to southwestern Fukien, but later most of them migrated to Kwangtung, where in order to escape opposition they settled in the more inaccessible mountains. Smaller groups spread to other provinces and compact communities may be found in many districts, even in far-off Szechwan. The total number who speak the Hakka dialect, which still resembles the *kuan hua*, or Mandarin, of the north, is estimated to be no less than 15 million. On account of their tribal purity it may be that they represent more clearly than any other group what the early Chinese people were like.

Unfortunately the Hakkas came into a restricted environment. Since their arrival they have done little to indicate any particular ability, although they have retained their fearless qualities and are ardent lovers of liberty. They are physically a strong race and the women never bind their feet. An unusually high percentage are educated.

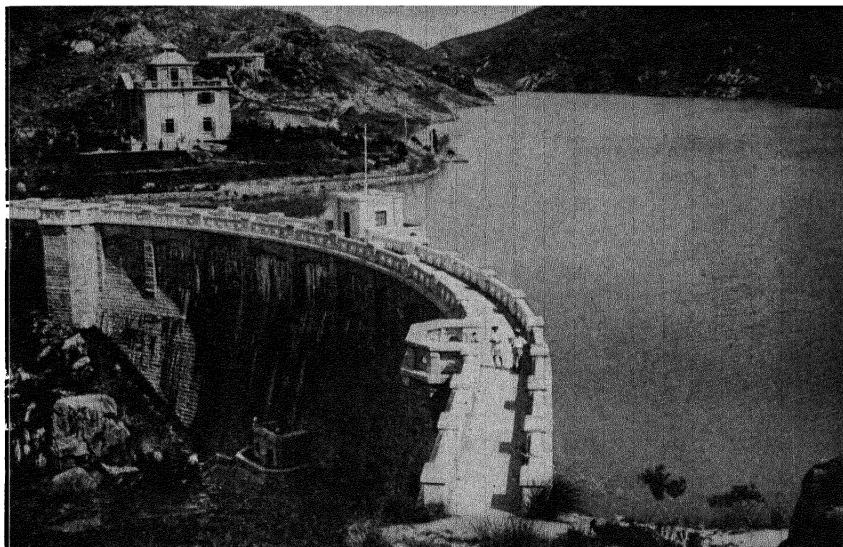


FIG. 171.—Amoy is one of the few cities in China to secure its water supply from a modern reservoir. (*U.S. Bureau of Foreign and Domestic Commerce.*)

With modern times their aloofness has broken down, and they have come out from the mountains to go to the coastal cities or overseas. Next to the Cantonese and the people from Amoy, they are the most widely scattered Chinese. This contact with the outside world has brought an interesting change. When transferred to a more favorable environment, their racial qualities have blossomed out much as a flower which is transplanted to better soil. In Swatow and elsewhere they occupy positions of commercial and political importance out of all proportion to their numbers. The qualities given the group by selective migration have apparently served to equip them with superior ability, so that they form a distinct and virile strain in Chinese life.

FOREST RESOURCES

These coastal provinces are among the most favorably situated regions in China for the development of a permanent forest industry.

The rainfall and temperature are high, so that trees grow easily. The character of the country precludes agriculture, so that tree cultivation would seem to be the logical use for much of the land. Vegetation grows luxuriantly and the hills are everywhere covered with foliage. This lush greenery gives a distinctive note to the landscape which is absent in most other regions, even in those other parts of South China where trees are common.

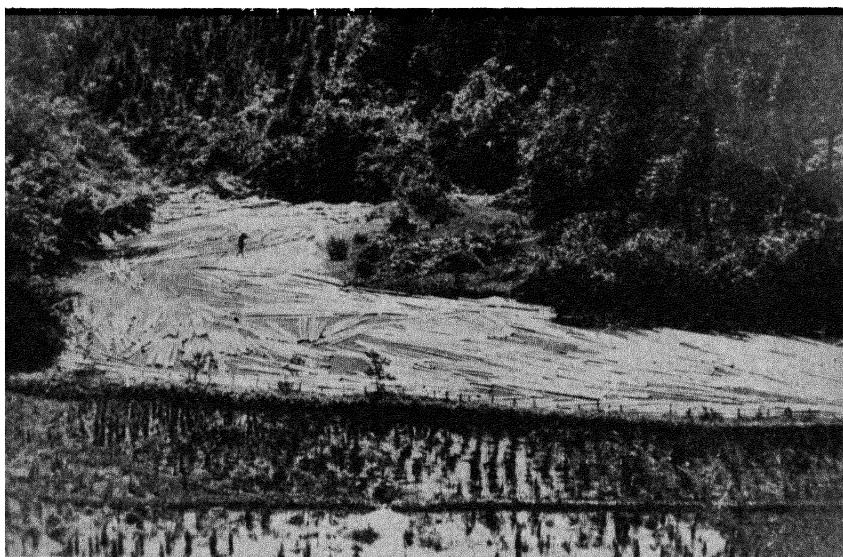


FIG. 172.—Abundant forests in the mountains make possible such scenes as this in Fukien. (*The Photo Bureau*.)

Many parts of the region are still covered with forest. In certain places where the forests have been cut over there is an attempt at systematic replanting. Most of the timber is approximately twenty to thirty miles from the rivers and must be carried on men's backs to the nearest stream, which adds greatly to the expense. In some districts lumbering forms the chief occupation of the people.

The most important tree is the fir, which is used for poles and for supports and rafters in buildings. The variety known as the *cunninghamia* is regularly planted and harvested as a crop. The value of the export from Fukien ranges from 5 to 8 million yuan annually, and the total number of poles shipped out in 1923 numbered 13 million.

Pine is the second timber in importance and is sawed into lumber for house construction, shipbuilding, and tea chests. The value varies from 2 to 4 million yuan a year, and the trees grow for the most part

without attention. Prices for 18-ft. lengths range from 2 yuan for an 8-in. log to 5 yuan for those 1½ ft. in diameter. It requires a century for either pine or fir to attain a diameter of a foot, but owing to the impatience of the owners many trees are cut after thirty or forty years. The Fukien pine competes directly with Oregon pine from America which is of superior quality and largely used in modern types of construction along the China coast. The production of Fukien pine in 1923 amounted to 40,000,000 sq. ft. of sawed lumber in addition to 1,500,000 tea chests.

Other species of timber produced in the Southeastern Coast include rosewood and camphor, the production of the latter being valued at approximately 1 million yuan a year. Foochow is the principal export center and most of the shipments are to the Yangtze Valley and North China. The cut lumber is sent by modern steamers; but 90 per cent of the fir poles are still shipped by native junks.

Bamboo is also an important product and is raised widely, forming a conspicuous feature of every landscape. It grows rapidly and is used in a multitude of ways. This plant, really a grass and not a tree at all, is the indispensable article of construction throughout South China. From it are made fences, mats, screens, bird cages, baskets, penholders, tobacco pipes, brooms, carrying poles, scaffolding and ladders, pipes for water, musical instruments, tables, and chopsticks, while the tender sprouts are a delicious food. It likewise is made into paper, used for reenforcing concrete and may someday form the basis for synthetic industrial alcohol.

CHAPTER XIX

THE HILLS OF LIANGKWANG

HILLS AND RIVERS

In southernmost China lie the twin provinces of Kwangtung and Kwangsi, once united in the Viceroyalty of Liangkwang or the "two kwangs." Except for areas in the extreme east and west, the geographic region of Liangkwang is synonymous with these provinces. Here more than anywhere else are the characteristics of South China developed to their full.

Most physical maps of China give a very incorrect picture of the land forms of these provinces. On maps which indicate elevations by shades of color, green is conventionally employed for land which has an average elevation of, say, less than six hundred feet. On such maps a wide belt of green is shown extending up the valley of the Si Kiang, or West River, far into the province of Kwangsi, with other areas of similar color along the Pei Kiang, or North River, and Tung Kiang, or East River. Such a representation of the topography gives an approximately true picture of the average elevation, but it is entirely deceiving if it suggests that the land is flat. Hills rather than plains dominate the landscape. The land which is actually flat probably does not exceed 10 per cent of the total area of the region.

Although Kwangtung and Kwangsi are filled with mountains, few areas contain well-defined ranges. Our knowledge of the mountain structure is far from complete, and many maps merely indicate mountains between each river with little regard to the geologic structure. Denudation has been active long enough so that in most districts the surface is in middle maturity. The heights of the summits vary from 1,500 to 2,500 ft., with a few peaks which rise to 6,000 ft.

The most important mountain area is that along the northern boundary of the provinces where there are a series of ranges which form the watershed between the tributaries of the Yangtze and the rivers which flow southward. These mountains present a series of parallel crests, in places as many as ten or more, with a trend from east or northeast to west or southwest. The mountains are called the Nanling or Nan Shan. To the south of the Si Kiang there is a mountain area separating the river from the southern coast of Kwangtung.

Still other mountains are in the island of Hainan where the central peaks rise to a height of 6,400 ft. Hainan covers approximately 14,000 sq. miles and is separated from the mainland opposite the Liuchow Peninsula by a shallow strait 15 miles wide. The northern third of the island is comparatively level, with occasional low peaks. From this plain the land slopes gradually toward the ranges of the south central portion which culminate in the Five Finger Mountains.

The mountains of Kwangsi are relatively low. Many are of limestone which has weathered in weird forms, producing sheer-walled pinnacles and towering spires. These rocky precipices rise abruptly from the lowlands and produce striking scenery.

Where the rivers break through the higher ridges, there are deep valleys with cliffs rising hundreds of feet above the water. Many of the valley bottoms are almost without level land, and where present it is limited to strips seldom more than a mile wide.

The principal river is the Si Kiang which rises in the highlands of eastern Yunnan and southern Kweichow. It flows entirely across the province of Kwangsi and is half a mile wide at Wuchow, 200 miles from the sea. The level of the water is subject to considerable fluctuation, depending on the rains, and there is an extreme variation of 75 ft. at Wuchow and 30 ft. at Samshui near the head of the delta. Fortunately such floods are not experienced every year.

At Samshui the Si Kiang is connected by a short channel with the Pei Kiang, most of whose water, however, continues to the sea in a separate system of distributaries, except when one or the other is in flood. The Pei Kiang flows southward across Kwangtung from the Nan Shan and at Samshui splits up into a ramifying system of channels which cover most of the Canton Delta. At present the Si Kiang flows directly to the sea along the western side of the Delta, although in previous times it doubtless spread its waters over a wider area.

The third river is the Tung Kiang in eastern Kwangtung. It has no direct contact with the others, although its delta continues without interruption to that of the Pei Kiang.

The coastline of Kwangtung is rugged and irregular but less so than that of the Southeastern Coast. There are many promontories and protected bays. Despite these natural harbors, fishing has not developed extensively, for the temperature of the ocean is warmer and not so favorable to fish as the cooler seas to the north. This region has a coastal fringe with many of the human characteristics found in the Southeastern Coast, but the cultural focus is in the extensive Canton Delta.

REGIONAL UNITY

Many of the factors which give integrity to the Hills of Liangkwang arise from topographic relationships. The hydrographic drainage, centering in a single delta, is paralleled by trading activities, most of which follow the waterways. Encircled by mountains and by the ocean, the cultural life of the region is self-contained with comparatively few contacts with adjoining provinces. Climate, soils, vegetation, and agricultural practices are essentially of a kind and present contrasts to those elsewhere. The coastal fringe west of the mouth of the Si Kiang together with the island of Hainan are maritime and quite tropical and have less in common with the rest of Liangkwang, but it hardly seems proper to place them in a separate region.

Thus, in establishing the boundaries of Liangkwang, as is the case with most regions, topography provides the basis. This does not imply that the region is purely physiographic or nonhuman but rather betrays the large part which environment plays in human affairs.

The eastern boundary of Liangkwang lies between the valley of the Tung Kiang, which flows into the sea near Canton, and the Han Kiang and its tributary the Mei which enter the ocean at Swatow. The Tayuling Shan continue southward from Fukien into Kwangtung between these rivers, but little is known as to the structure of the southern part. High mountains separate the two valleys and the regional boundary is drawn along this line. It reaches the sea near but to the west of Hweilai.

Along the north the limits of the Hills closely agree with the political boundary, except that a small part of southeastern Kiangsi is included. This is true as far west as the vicinity of Kweilin where three hsien of Kwangsi belong to the South Yangtze Hills. This northern boundary follows the poorly defined crest of the Nan Shan.

The western boundary is transitional and less distinct, for it cuts directly across the chief rivers of Kwangsi and is not marked by any mountain range. The northwestern portion of the province is considerably higher, and there is an increase in ruggedness and relief, giving rise to contrasting human responses. The regional boundary is transitional and irregular, extending westward up each of the main river valleys. It departs from the provincial boundary in the north near Tienho and joins it again south of Chenan in the southwest.

The southern limits of the region are the Gulf of Tongking and the South China Sea. Much of this coast line of 800 miles is isolated from the remainder of the region by mountains. The island of Hainan

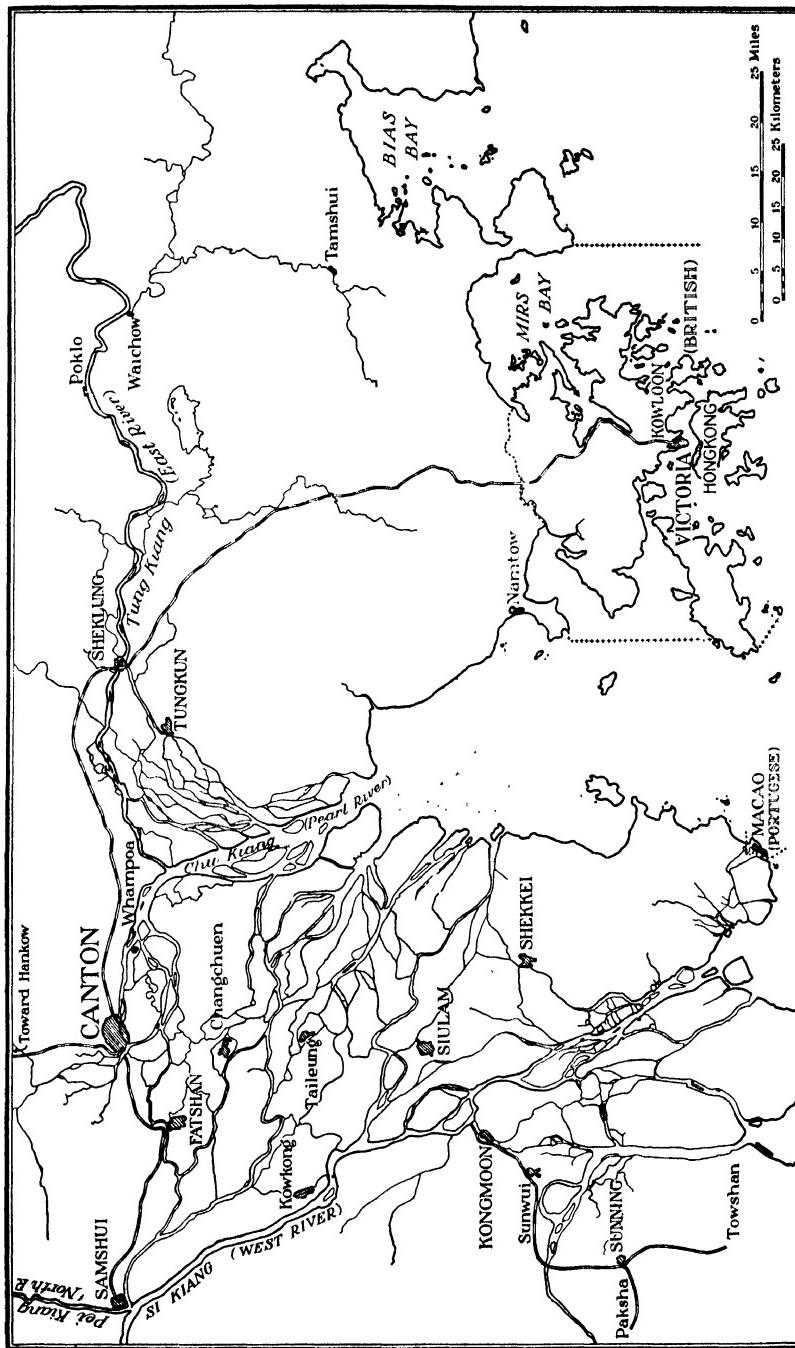


FIG. 173.—Canton and Hongkong are the commercial centers for the valleys of the Si, Pei, and Tung Kiang.

is also included. The area of the Hills of Liangkwang is 144,086 sq. miles (373,280 sq. km.).

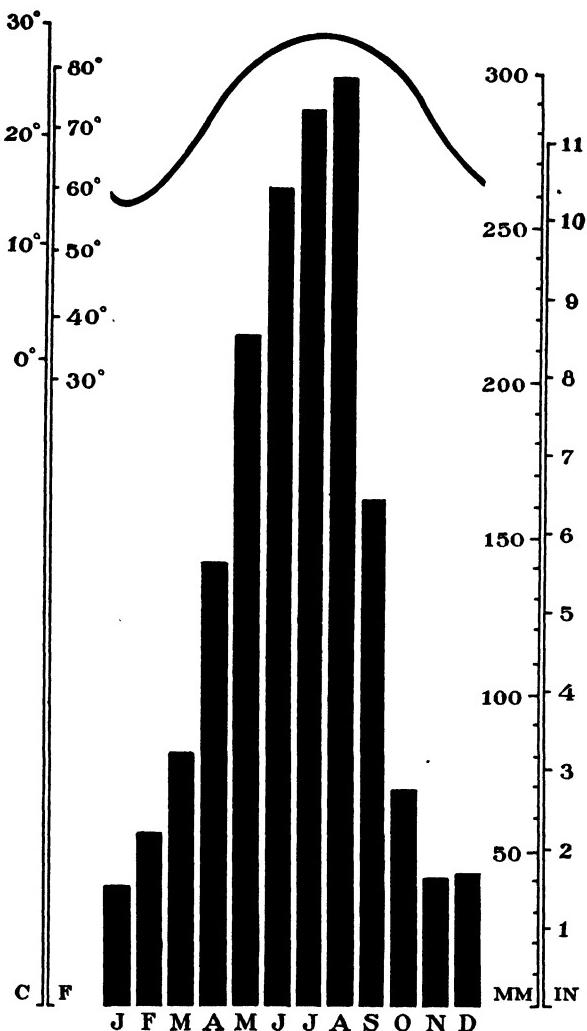


FIG. 174.—Climatic conditions in Liangkwang. Rainfall averages derived from Canton (1,699 mm.), Samshui (1,787 mm.), Wuchow (1,299 mm.), Nanning (1,268 mm.), and Pakhoi (2,169 mm.). Temperatures from the same stations.

A TROPICAL CLIMATE

This is tropical China. The Tropic of Cancer where the sun's rays shine from directly overhead on June 21 lies 21 miles north of Canton, so that the major portion of Liangkwang lies within the tropics. As a

result, the temperatures are high during much of the year, and vegetation grows more luxuriantly than in any other part of the country. The landscape is always green and is in striking contrast with the parched brown hills of the North during the winter months.

The year may be divided into three seasons. There is a long wet summer with excessive humidity and considerable heat from the middle of April to the middle of October, then a relatively dry, cool winter with pleasant days to the middle of February, followed by two months of transition with foggy and muggy weather. In the interior the maritime influences become less and less and the variations in temperature are greater than near the sea coast, with warmer summers and cooler days during the winter. In Kwangsi and in northern Kwangtung the mountains moderate the summer warmth but the winters are cool, with a little snow on the higher peaks. The most pleasant period of the year is the short winter when the skies are generally clear and the temperatures delightful.

The rainfall of Liangkwang is governed by the monsoon and by occasional typhoons. During the summer months the moisture-laden south winds from the ocean bring a heavy rainfall, while during the winter the wind is usually from the north or northeast and so is dry. Typhoons are less common than in the Southeastern Coast but they occasionally cross the coast, and their milder effects may be felt a hundred miles inland. The total rainfall varies from 1,200 mm. (47 in.) in the extreme west to 1,800 mm. (70 in.) in the east, with a marked concentration from April to September. The maximum occurs in August, the latest anywhere in China, with an average of 12 in. The winters are comparatively dry, for three months have less than 2 in. each. High humidity, often excessive, is a significant feature of the climate.

Owing to the southerly latitude and comparatively low altitudes, the temperature is high at all seasons. From May to September the thermometer stands at uncomfortable heights, but the maximum seldom exceeds 38°C. (100°F.). Although it is much farther south, Canton is seldom hotter than Shanghai, but the warm season continues much longer. During the winters the temperature rarely goes below 5°C. (40°F.) except in the mountains, so that frost and snow are very uncommon. The day and night average for July is about 30°C. (85°F.), while in January it varies from around 20°C. (70°F.) in the island of Hainan to 15°C. (60°F.) along the valley of the Si Kiang.

MAN'S USE OF THE LAND

The people of Liangkwang are essentially "wet" farmers and have little experience in utilizing dry slopes. Cultivation is chiefly confined

to low-lying fields which can be irrigated from streams or shallow wells. In such places the soil usually consists of fertile river deposits which give a large yield. Elsewhere soils are reddish laterites, very deficient in humus. Wherever water is available, the land is intensively cropped, and this region is one of the most highly developed agricultural areas of China. This is especially true in the Canton Delta. Three crops a year are the rule in many districts, and famines are almost unknown.

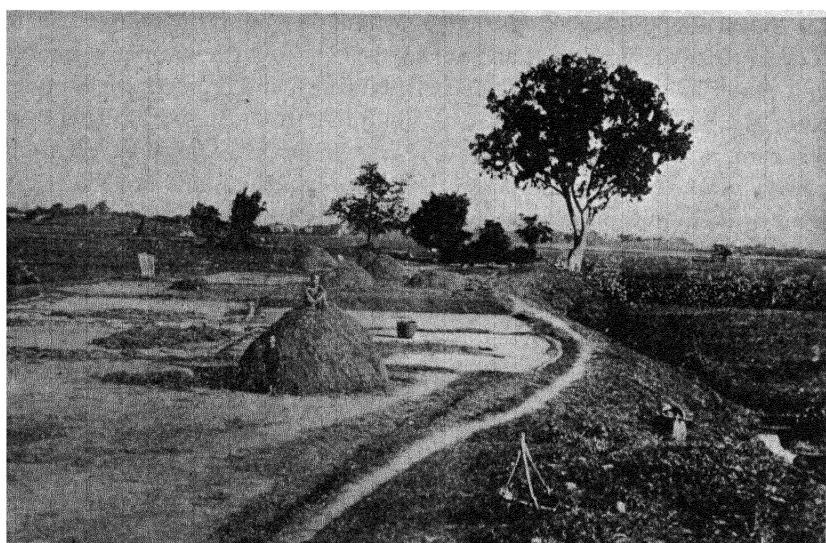


FIG. 175.—Drying floor and compost piles in the delta lands near Canton. (*U. S. Bureau of Foreign and Domestic Commerce.*)

The exact area of crop land is uncertain. Based on the figures of the Ministry of Agriculture and Commerce, only 8 per cent of the Hills of Liangkwang is cultivated. Owing to the distance from Peiping, the compilation of these figures may have been less carefully supervised than in other provinces, but the results are at least an approximate indication of the topographic conditions.

A close confirmation is found in the 1932 estimates of the Nanking Directorate of Statistics for Kwangtung, figures for Kwangsi not being available. The irrigated land is reported as 24,690,000 mow and the unirrigated land as 17,762,000 mow. This is 8.2 per cent of the area of the province. The average for Kwangsi is undoubtedly lower, so that allowing for all omissions it seems unlikely that arable land in Liangkwang exceeds 10 or 15 per cent.

The population of Liangkwang numbers 41,050,849 people, about three-fourths of whom live in Kwangtung. This gives an average density of 285 per square mile. These figures do not include the foreign districts of Hongkong, Macao, or Kwangchow Wan which have a combined population of about a million. The people are so concentrated in the level land along the rivers that the map showing the distribution of population is at the same time a good index to land forms.

Since the cultivated area, as listed in the Statistical Summary, amounts to 46,194,485 mow, there is an apparent density of 3,495 people per square mile of crop area, or an average of 1.1 mow per capita. Only through double or triple cropping and the most exhaustive care can this limited area maintain such a population.

Fertilization is carried on with minute care. All human wastes, in both city and country, are saved and applied at the proper time in small amounts directly at the base of the growing plant. King¹ estimates that in this way the Chinese return to the fields 2,712 lb. of phosphorus and 4,488 lb. of potassium per day for each million of the adult population.

This intensity of cultivation impresses itself forcibly on the traveler, with reactions which vary according to one's temperament. To some the almost frantic activity bears the marks of a bitter and fatalistic contest, while to others the dominant impression is of the cheerfulness of the people and a respect for the industry and skill which have so remarkably developed the face of the earth. One writer has described this as "a land gnawed to the subsoil by the ceaseless effort of innumerable greedy generations, despoiled of all forest, cultivated to its last palm of earth, sapped of its vigor, yet where man is ever febrilely multiplying himself." Only the favorable nature of the climate in permitting agriculture to be carried on throughout the year makes possible such crowding as characterizes the arable land of Liangkwang.

The complete utilization of the lowlands is in sharp contrast to the hillsides whose chief use seems to be for graves or for the growth of fuel. There is only a limited amount of terracing and it seldom extends more than a short distance above the valley floor. In view of the need for food, it is surprising that so little attempt has been made to make the hills productive.² In part the explanation lies in the conservatism

¹ KING, F. H., "Farmers of Forty Centuries," 74.

² The following letter from an agriculturalist describes a large undeveloped area in southern Kwangtung, "Scarcely one-tenth of the land is in cultivation, and we traverse mile after mile of neglected, upland, hilly wastes, from which each year the grass is burned for fertilizer, or gathered for fuel, resulting in the neglect and deterioration of soil

of the farmers who are accustomed to flooded fields. A more important reason is found in the soil, which is often poor and thin. In many places where the slopes are not too steep it should be possible to raise tree crops or to pasture animals. Fruit and nuts grow well in Liangkwang, while cattle are already reared in considerable numbers in Kwangsi for foreign consumption in Hongkong.

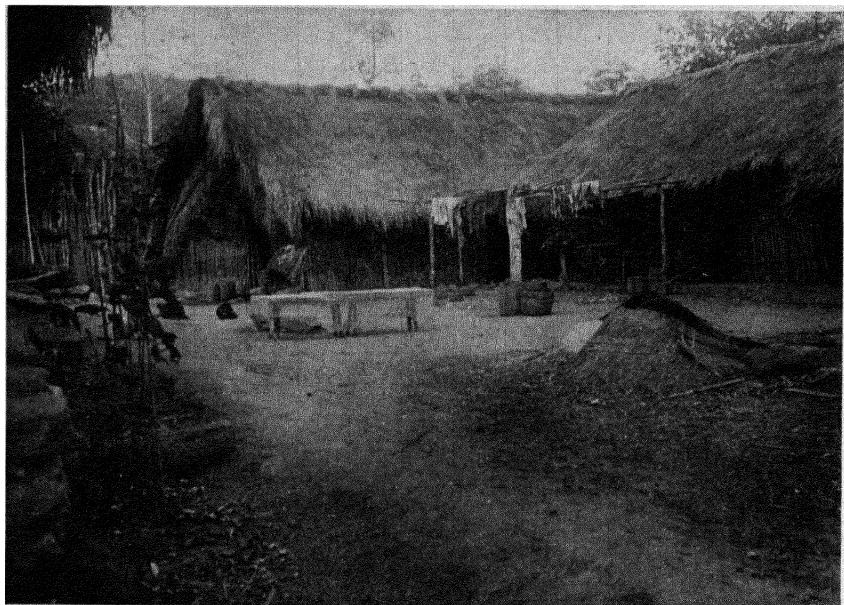


FIG. 176.—Courtyard of a farmhouse in the tropical island of Hainan. (*Clifford Pope, courtesy American Museum of Natural History.*)

The cultivation of rice is the dominant agricultural occupation. Two crops are obtained wherever the fields can be irrigated, but in the upland areas where water is not available it is necessary to wait for the summer rains so that only one crop can be raised. The planting seasons are in March and August with harvests in June or July and November. The yield is high and the total production large, but the quantity is insufficient for the dense population, so that large additional amounts must be imported, in both Kwangtung and Kwangsi.

which only years of cultivation and green-manuring can overcome. But trees take hold quickly on most of this soil, the climate is good, and we have a conviction that with modern power farming, plus the energy and patience of Chinese peasantry, much can still be done when transportation and police protection are solved. Of the latter we are at the very threshold."—G. Weidman Groff, Lingnan University (1932).

While rice is the preferred crop on all lowlands, a large variety of other products are raised on slightly higher ground. The farmers of this region are very ingenious in adjusting their efforts according to the season, for no two years are exactly the same. During dry years when rice is poor more sugar cane is planted, while in wet seasons when many paddy fields are flooded ducks are raised in large numbers. Some products are either winter crops on the drained rice fields or summer crops on the upper dry terraces.

Many kinds of vegetables are raised throughout the region and at all seasons. Sugar cane and tobacco are both significant crops. Matting straw and palm leaves for fans are two unusually important industries and the district of Sunwui is especially famous for its export of the latter to the United States. Large quantities of tea are grown in the northern hills of Kwangtung.

Excellent fruit is raised. Of the several varieties of oranges, the loose-skinned mandarin or tangerine is exceptionally sweet. One of the most delicious fruits is the lichee which has a short season in June. Bananas are grown in the warmer districts. Kwangtung produces large quantities of ginger of the best quality.

Two other tree crops of interest are tung oil, which is used in paints and varnishes, and cassia. China produces 65 per cent of the world's supply of cassia and the bulk of this originates in Kwangsi where the oil is obtained from a wild tree. The bark of cassia resembles cinnamon.

Silk is the premier cash crop of the region and forms the leading export, most of it going to the United States by way of Hongkong. Mulberry trees are widespread and are carefully fertilized with human waste, garbage, bran, silkworm excrement, chemical fertilizers, and canal mud. Most of the farmers who grow mulberry also keep fish which are raised in canals and ponds so that the bottom mud forms an excellent fertilizer, while the waste cocoons feed the fish.

The mulberry leaves are gathered six or seven times during the year. Kwangtung leads Kwangsi in silk production but the output of Kwangsi is increasing. The people of Liangkwang have not been quite so progressive as those of central China in the introduction of scientific methods but there are a large number of modern steam filatures for the reeling of the silk from the cocoon.

The eastern section of the Hills of Liangkwang is more developed agriculturally than the west. This is partially due to the favorable location and to the greater areas of level land. Natural conditions appear to be essentially similar throughout the region and some expansion of agriculture may be looked for in Kwangsi.

The island of Hainan and the Luichow Peninsula are much more tropical than the remainder of Liangkwang, and agricultural conditions are correspondingly modified. Here too are possibilities for agricultural development.

NATURAL RESOURCES

The Hills of Liangkwang are moderately well supplied with a variety of mineral deposits and many localities yield a small production by crude native methods. Geological studies are less complete than in other regions, and it is not safe to assume that the deposits are of large size. They are at least sufficient to make possible an increase over the present output and should furnish the basis for a considerable industrial expansion.

A good quality of coal is found in both Kwangtung and Kwangsi. The principal production is near Shiuchow north of Canton, but there are at least half a dozen other mines. The annual yield fluctuates but seldom exceeds 1 per cent of the output for the entire country. There is no production of iron and the reserves are not known.

The principal metals are tungsten, manganese, tin, antimony, and bismuth, in the order of their production by weight. Most of these are exported, and their sale forms a considerable item in the regional income. There are fifty mines in Kwangsi alone, but most of them operate on a small scale with limited capital, inefficient methods, and without geological advice. The lack of adequate transportation facilities is a serious handicap.

Most of the region is without forests, but there is a large production of firewood in the mountains of Kwangsi which is floated down the Si Kiang in huge rafts for use in Canton and Hongkong.

COMMUNICATIONS BY LAND AND WATER

Liangkwang is knit together by its three principal rivers and their tributaries. Wherever possible travel is by water, and the rivers furnish splendid highways, on which there are fleets of junks, launches, and river steamers, carrying an astonishing amount of freight. These rivers make Canton and Hongkong twin foci in the economic life of the region.

The Si Kiang is one of China's major rivers and forms the principal avenue of commerce for Liangkwang and the southwest. It is navigable for junks to the borders of Yunnan, while river steamers may reach Wuchow at the eastern margin of Kwangsi. Except for occasional sand bars and sharp bends, it might be utilized by ocean vessels. Wuchow may be compared with Hankow on the Yangtze, since it is

a river junction and commercial port of considerable importance. Table XXXII gives the significant facts concerning the chief waterways in the region.

TABLE XXXII.—RIVERS OF LIANGKWANG

Name of waterway	Distance navigable		
	For 15-ft. draft steamers	For 6-ft. draft steamers	For motor launches, miles
Si Kiang (West River).....	230 miles in flood season	230 miles in low water	700
Pei Kiang (North River).....	60 miles during 2 months of year	60 miles during 7 months of year	93
Tung Kiang (East River).....		68 miles during 2½ months of year	124
Kwei Kiang			200
Chu Kiang (Pearl River)	87 miles		

Source: Julean Arnold, "China, a Commercial Industrial Handbook," 414.

In the delta, canals have been dug wherever necessary, so that there is a detailed pattern of waterways for irrigation and boat traffic. Elsewhere the topography seldom permits canal construction.

Away from the rivers travel is on foot or by sedan chair. Winding flagstone trails lead over the hills or among the rice fields of the lowlands. These paths are commonly but a few feet wide and are paved with large stone slabs. This is not a land of carts or pack animals. South China is so densely crowded that there is no spare agricultural land for pasturage or for raising hay. Man has replaced all transport animals and carries the burdens of commerce by means of long poles borne on his shoulders. The only wheeled vehicle is the wheelbarrow, the use of which is much less common than north of the Yangtze. The expense of coolie transport has increased rapidly owing to the general rise in the cost of living and to unsettled labor conditions. It now amounts to at least one yuan per day for a load of 70 lb. over a distance of 12 miles.

Within recent years several thousand miles of automobile roads have been constructed, and hundreds of automobiles are now running, many of them operating as public busses. This new construction has been especially noteworthy in Kwangsi, formerly regarded as one of the backward provinces. In January, 1928, newspaper dispatches reported

that 152,000 people, including farmers, soldiers, and school children, were engaged in road building. By the spring of 1929, 5,000 li had been completed and the province now has one of the best systems of highways in China.



FIG. 177.—Taxi service around Canton is provided by these Tan boatwomen. When not soliciting trade these boats cluster together to make a floating town. (*Ato Photographic Association*.)

Railroads have been built only in the eastern section, and the total mileage amounts to about 400. The most important of these are the ones from Canton to Kowloon, opposite Hongkong, and the uncompleted section of the railway from Canton to Wuchang on the Yangtze, which extends almost to Hunan. After years of delay, construction on this northern line is again in progress, money being supplied by British Boxer Indemnity Funds. The completion of this road is the most urgently needed piece of railway construction in all China. When finished, it will make possible through travel between Peiping and Canton and perhaps do as much as any other single thing to unify China. Hongkong will then be connected by rail with Europe. The unfinished section lies in the mountains of northern Kwangtung and southern Hunan and involves difficult although by no means impossible engineering problems.

The Hills of Liangkwang have three historic routes of travel leading to the provinces of the north. The most important of these is by way

of the Pei Kiang and the Meiling Pass to Kiangsi. This route from Canton to Nanchang and the Yangtze was part of the old imperial highway. Owing to the fact that this route was used by the Macartney and Amherst embassies to Peking over a century ago, it is sometimes known as the Ambassadors Road. For almost all of the distance it is possible to travel by water, first along the Pei Kiang to Shiuchow and then up the Fi Shui to the divide between Kwangtung and Kiangsi. The Meiling Pass is at an elevation of about 1,000 ft. and involves a land portage of 24 miles. A constant procession of carriers are engaged in transporting the trade which moves over this route.

The second pass is the Cheling which is on the road to Changsha and Hankow. It branches from the first at Shiuchow and continues northwards along the Pei Kiang to the borders of Hunan. The pass is at an elevation of 984 ft. and the portage is about 30 miles. This is the route of the proposed railway to Wuchang.

The third line of communication provides an all-water route to the Yangtze but is little used at present. It involves a roundabout course from Canton up the Si Kiang to Wuchow and thence northward along the Kwei Kiang to Kweilin. Beyond this a canal, reported to have been built in 214 A.D., has been cut through a low divide to the headwaters of the Siang Kiang which flows past Changsha. On account of its greater length and the presence of over three hundred rapids between Wuchow and Kweilin, there is now practically no through traffic. It is said that an additional reason for this situation lies in the presence of a low bridge underneath which large boats cannot pass. So great is the conservatism of the people in its vicinity that this bridge cannot be altered.

THE CANTON DELTA

The Canton Delta has the largest area of level land in Liangkwang and is the economic center of the entire region. This crowded plain forms a subregion similar in its intensive development to the Chengtu Plain and the delta around Shanghai. It stands out with these other areas as one of the most highly developed agricultural areas in the world.

Not all of the subregion is actually level, for there are numerous hills of red sandstone which have been enveloped by the advancing alluvium of the delta. The need for agricultural land is such that parts of the delta have been diked off before the normal work of sedimentation is complete, so that it has been necessary to construct great embankments along some rivers and parts of the seacoast. Floods occasionally break through with considerable damage.

Waterways abound and are the chief means of communication. In addition to the many channels of the rivers, there is a network of canals, and the whole delta is a labyrinth of passageways which divide and reunite bewilderingly. In many cases it is impossible to distinguish whether a specific waterway was originally an artificial canal or a natural river.

The most important river is the Chu Kiang, or Pearl River, which is partly an independent stream and partially fed from the Pei Kiang. It flows along the northern section past Fatshan, Canton, and Whampoa and enters the sea through the Bocca Tigris, the gate of the tiger's head, near Hongkong. The Chu Kiang is not a large river but derives its importance from the commerce which passes over it.



FIG. 178.—A grocery store in Canton. Fresh fruits include several kinds of bananas, persimmons, oranges, pomelos, and mangos. (*Ato Photographic Association.*)

The total area of the delta is approximately 2,890 sq. miles, of which an appreciable part consists of hills or water, so that the usable land may amount to but three-fourths of this figure. On this restricted and hill-studded plain there are seven hsien: Canton, Namhoi, Sinhwei Tungkwan, Taileung, Samshui, and Chungshau, with a total population of 8,983,487. This gives the amazing concentration of over 3,100 people for every square mile (1,150 per square kilometer). While there are several large cities included within this total, the fact remains that the density of the agricultural population is truly enormous. So great is the economic pressure for livelihood that every scrap of level land is

utilized and the people have spilled over on to the water where some two hundred thousand live in boats.

TABLE XXXIII.—CITIES OF LIANGKWANG

City and province	“Christian Occupation of China” (1922)	Maritime Customs (1931)	Arnold, “Commercial Handbook” (1926)
Canton (Punyu, Kwangchow) Kwangtung ¹	1,600,000	861,024	900,000
Victoria (with Kowloon), Hongkong ².....	.....	.....	681,800
Fatshan (Namhoi), Kwangtung.....	450,000		
Sunwui, Kwangtung.....	200,000		
Kongmoon (Pakkai), Kwangtung.....	168,000	32,200	77,000
Shiuchow (Kukong), Kwangtung.....	120,000		
Wuchow (Tsangwu), Kwangsi	80,000	90,000	50,000
Macao, Portugese.....	80,000		
Nanning (Yungning), Kwangsi.....	50,000	68,110	67,400
Liuchow, Kwangsi.....	60,000		
Kweilin, Kwangsi.....	60,000		

¹ Census, 935,708 (1932).

² Census, 754,180 (1928).

The development of agriculture is, if possible, an intensification of that already described. The richness of the soil, the plentiful moisture, and the superabundance of labor combine to make soil culture a highly developed art. The plain throbs with activity, and wherever one looks there are compact villages and industrious people.

The emigrants who have gone out from this region have given to the rest of the world its conception of China. Probably the average European or American would scarcely recognize the sharper and more distinct Pekinese dialect as being Chinese at all, for it differs so radically from the musical and more nasal tones of Cantonese. The southerners likewise have a greater development of the almond eye and are much shorter in stature. To the rest of the world, the picture of Chinese city life is in terms of narrow streets packed tight with yellow humanity and reeking with varied odors. Old Canton is just what uninformed foreigners expect to find everywhere in China.

CANTON VERSUS HONGKONG

South China was the first part of the country to carry on overseas trade. The foreign commerce of Canton is of very early origin, dating back into obscurity more than a thousand years. The Arabs and the Portuguese were among the first to participate in this trade and it was only during the nineteenth century that the British became

commercially important. The original trade was carried on at Canton, but owing to unsatisfactory political relations the British secured the barren island of Hongkong as their commercial base and on its sloping sides have built the great modern city of Victoria, now one of the leading ports of the Far East.

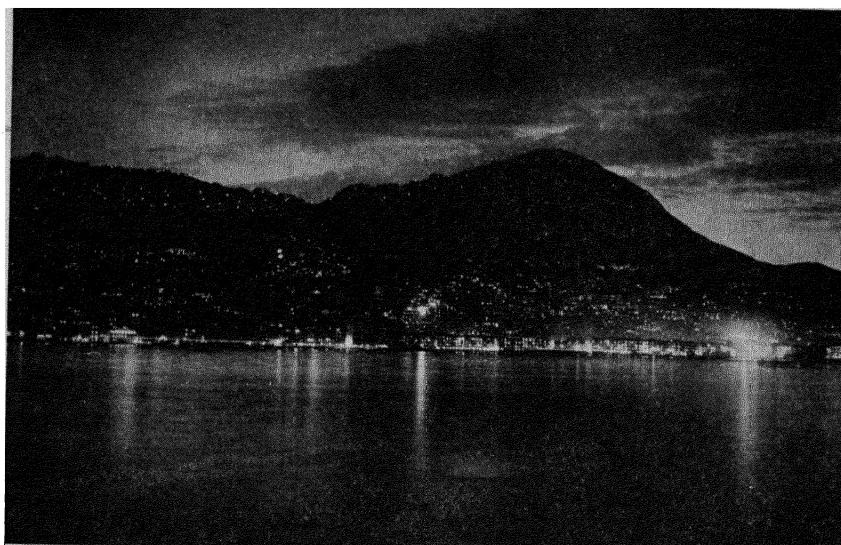


FIG. 179.—The island of Hongkong and “The Peak,” at the foot of which lies the city of Victoria. (See also Fig. 69, p. 154.) (*Brewer and Company*.)

Hongkong and Canton are at present engaged in a commercial rivalry which has a geographic as well as a political basis. In the early stages of commerce along any coast there is need for a central distributing point from which the cargo of large ocean vessels may be split up for distribution by smaller coastwise boats to local ports. The development of Hongkong is an example, for the smaller ports of Canton, Pakhoi, Swatow, Amoy, and Foochow have had neither sufficient trade nor adequate facilities to attract large liners.

The question today is whether there is still need for such a central port. Hongkong has the banks, commercial contacts, and prestige which are essential for large undertakings, and it cannot be displaced unless some one or more other centers have equally good commercial and physical facilities. The time may come when a number of cities along the southern coast will each have sufficiently large exports and imports to deal directly with foreign nations rather than through Hongkong. That time has not yet arrived.

In addition to its early start and splendid harbor, Hongkong has a number of distinct advantages. It lies close to the main ocean highway between Europe and the Orient and is a logical port of call. It is also well situated with regard to its hinterland, for Swatow and Canton are each but an overnight run distant. Hongkong is actually nearer the



FIG. 180.—An aerial view of Canton in 1929, showing the foreign concession of Shamian in the foreground. All over the city new-style buildings rise above the old one-story homes. (*Lingnan University*.)

mouth of the Si Kiang than is Canton. When Hongkong was ceded to England, one of the arrangements was that it should always remain a free port. This absence of customs requirements is an additional inducement to trade.

The development of the inhospitable island of Hongkong and the leased territory of Kowloon across the bay has been a remarkable achievement, for which credit must be given not only to the energy and skill of the British but to the Chinese as well. Without the rich hinterland no trade could exist. The city of Victoria, often called by the name of the island, is built at the foot and up the slopes of "The Peak" which rises steeply to a height of 1,825 ft. above sea level. The view from across the harbor at night is one of matchless beauty, for the myriad lights make the hill gleam like a starlit fairy land.

Canton lies in the midst of a rich alluvial plain and looks landward rather than seaward. The city, known in Chinese as Kwangchow

or Punyu, was founded about A.D. 1053 when the Chinese first drove out the Tai race and occupied Kwangtung. Canton is three hours distant from Hongkong by rail or overnight by boat. It lies on the left bank of the Chu Kiang, with a depth of but 6 ft. at low tide and so only navigable for shallow-draught river steamers.

The immediate site is impractical for a world port, but 9 miles downstream there is deep water at Whampoa, which it is hoped to develop as a point of call for ocean liners. Preliminary surveys indicate that it will be necessary to dredge at least 12,000,000 cu. yd. of silt from the bar below Whampoa, at a cost of about one yuan a cubic yard, and that the annual upkeep will amount to at least 8 per cent of this figure. Engineering advice indicates that it may be possible to develop a first-class harbor here. Whether or not it will pay, or whether it will replace Hongkong, gifted as it is with a splendid natural harbor, are two quite different questions.

The future development of Canton as an ocean port depends not so much on its harbor facilities as on the volume of its foreign trade. When Canton controls sufficient commerce to attract the ships of the world, they will naturally come, and their coming will make river improvement possible. Until that time, political attempts to overcome economic and geographic situations will be premature.

Canton is one of the most progressive and rapidly developing cities in all China. It was among the first of the southern cities to introduce wide streets and to tear down the old city wall. Miles of paved roads and suburban developments give a modern air. The Bund is lined with splendid buildings, five to ten stories high, and the whole city is being rebuilt. In contrast, sections still have old narrow streets with their teeming, jostling life. Few cities in China presents such striking contrasts between the ancient and the modern. Canton is a city in evolution, and a walk through its streets both old and new is like a trip from today to the Middle Ages. Much of this development has taken place on the initiative and direction of Chinese who have returned from overseas. The progress which has been made is all the more remarkable when it is realized that it has occurred during a period of acute civil and political disorder.

THE PROGRESSIVENESS OF THE CANTONESE

The people of Kwangtung and Kwangsi have the reputation of being the most enterprising and industrious in all China. Some of the adjectives which various writers have used in describing them are brave, energetic, enterprising, active, independent, radical, and fiery. The inhabitants of this region include several cultural groups, and these

terms apply particularly to the Cantonese who dominate the economic and political life. The progressiveness of Liangkwang is largely an urban phenomenon, for agricultural conditions are similar to those throughout the South.



FIG. 181.—Recently widened streets and new business buildings in the model city of Wuchow, Kwangsi. The city authorities have passed an ordinance prohibiting rickshaws and man-pulled carts, in the hope of passing directly to the automobile stage.

How shall we explain the vigor of the people of Liangkwang? The long period of high temperatures and enervating humidity would seem decidedly unfavorable for human activity. Canton lies within the tropics at the same latitude as Calcutta and Havana and Rio de Janeiro, and yet there are probably few cities at sea level within the tropical zone where the native inhabitants display so much energy. Long foreign contacts are commonly given as the answer, but only a very few of the millions who live in the region can have had any direct dealing with traders. If this were the only explanation, it should apply equally well to Calcutta.

In the course of the past century millions of emigrants have gone out from Liangkwang and the Southeastern Coast and are scattered in all parts of the world. Probably no nation except Britain has so

many of its representatives on foreign soil. Of the ten or twelve millions of Chinese who live outside China, most have come from Kwangtung and Fukien. Many of these adventurers have become wealthy and have sent back large sums of money to their relatives in the home land, or have returned themselves with a priceless cargo of ideas.

While these international contacts have doubtless played a part in the characteristics and prominence of the Cantonese, it seems probable that other factors have been equally important. The inhabitants of South China have undergone extensive natural selection in the course of their migrations from the north. The mountains south of the Yangtze have served as a human filter and it may be that only the more capable elements of society have squeezed their way through. The Cantonese and the Hakkas, many of whom live in the mountains of Liangkwang, thus appear to have a unique racial endowment.

Despite its early start, the advantages today are not entirely on the side of Liangkwang. North China has a much more invigorating climate, far greater resources of coal and iron, and the greatest agricultural possibilities of the nation. Its curse of famine is largely the result of overcrowding and deforestation, neither of which is an entirely insuperable problem for the future.

One has only to compare either the rickshaw or the speed of the puller in Canton and Peiping to see a contrast in favor of the North. Few people in the North would deign to ride in the uncomfortable rickshaws of the South which until recently have had unattractive bodies with wooden-spoked wagon wheels and solid rather than pneumatic tires. The fastest puller in Canton could scarcely keep up with the average on the streets of the typical northern city. Quite naturally so, for coolies do not race each other down the street for the sheer joy of it when the humidity is around 80 per cent.

Railroad construction in the Hills of Liangkwang is handicapped by the topography, but the Loess Highlands have a greater length of mountain railways with more difficult engineering problems than anything yet built in the South. Before Liangkwang can claim the position of leadership there are many rather backward situations which must be explained.

CHAPTER XX

THE SOUTHWESTERN TABLELAND

A DISSECTED TABLELAND

The Southwestern Tableland is a spur of the great Tibetan plateau which extends into Yunnan and Kweichow. High and rugged surfaces, cut by deep valleys and crossed by towering mountains, make up most of the region. Little of the area is actually level. The highest elevations are in the west where alpine peaks rise to a height of over two miles. The general slope is to the south and east away from Tibet, with drainage on the south into the Yuen Kiang or Red River and the Si Kiang, and on the north and east to the Yangtze Kiang.

The region may be divided into two related subregions, the plateau of Yunnan and the mountains of Kweichow. In Yunnan the average elevation is approximately 6,000 ft., while in Kweichow it is about 4,000 ft. Yunnan is more distinctly a plateau and contains larger areas of level plains or rolling uplands than Kweichow, but both districts are distinguished by canyon-like valleys and precipitous mountains. Erosion has been most extensive in the east where the topography is thoroughly dissected.

Scattered throughout the Tableland are high plains, small in area and separated by mountains. A number represent undissected portions of an old plateau surface, once more extensive. Only fragments of these plateaus remain, for the rest have been carved into a sea of mountains or broken by faulting. A more important type of plain is formed by old lake basins, now partially or entirely drained. Large lakes still remain in the vicinity of Tali and Yunnanfu, and the plains surrounding them form the most important agricultural areas of the Tableland. Other alluvial tracts border some of the rivers, but they are usually narrow and subject to flood. Many of the rivers flow in canyons, but where the rocks are soft, and in the east where the elevations are lower, there are some open valleys with wide plains.

The total area of level land is not known; in eastern Yunnan it may exceed 10 per cent, but for the Tableland as a whole it is doubtless closer to 5 per cent of the entire region. A limited amount of slope cultivation would slightly raise the percentage of the area which is available for agricultural purposes. Although the plains are the most

important areas from the human standpoint, most of them are so small that they fail to show on the available maps.

Rugged mountains and deep gorges dominate the landscape. The rivers flow in valleys which are often 2,000 ft. deep. Their steep-sided canyons form serious barriers to travel, for almost none of them are navigable. The mountains tower above the average level even more strikingly than the rivers cut into it, and the higher ranges rise some 4,000 ft. above the plateau level. The structural trend is north and

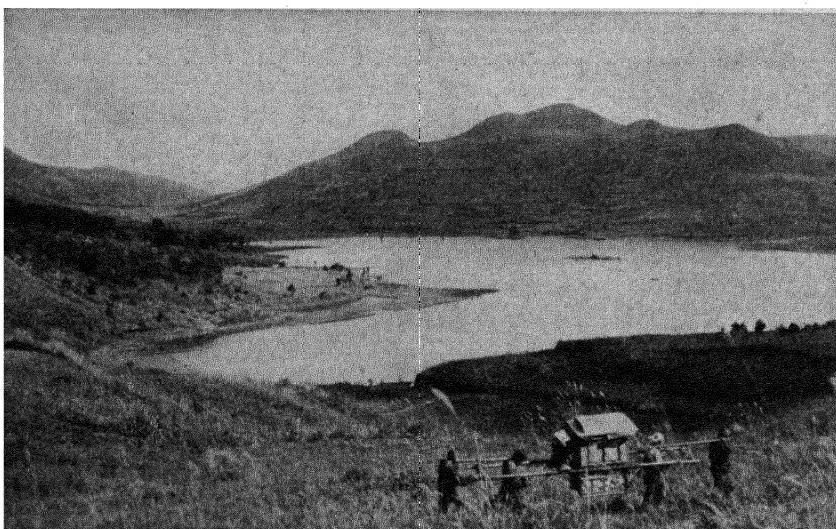


FIG. 182.—The numerous lakes on the plateau of Yunnan add beauty to an already picturesque landscape. Sedan chairs are the principal means of overland travel in all provinces south of the Central Mountain Belt. (*China International Famine Relief Commission.*)

south in Yunnan, turning to east and west in Kweichow. Rugged topography characterizes the region and it must be remembered that the term *tableland* refers to the comparative elevation and the chief agricultural districts rather than to the actual nature of the land forms throughout.

There have been several devastating earthquakes in the western half of the Southwestern Tableland, and this region has been almost as severely affected as the Loess Highlands.

The region lies largely in the provinces of Yunnan and Kweichow but also includes a few hsien of southern Szechwan and the western quarter of Kwangsi. The boundaries are not sharply defined but are for the most part irregular transitions from the dissected tableland

to the lower hills of adjoining regions on the north, east, and south, and a similar gradation to the high ranges of Tibet on the west. About two-fifths of western Yunnan is excluded, either on account of its rugged Tibetan characteristics or, in the south, because it resembles the tropical hills of Indo-China.

The northern boundary lies along the Yangtze in northern Yunnan and somewhat south of that river through southern Szechwan. On the east, the limits are especially indefinite and are drawn for convenience along the Kweichow-Hunan border as far south as Kwangsi, where they turn southwest to a point near Tienho and cut across Kwangsi to south of Chenan. The western limits of the Tableland touch the Yangtze Kiang at Shihku, west of Likiang, and extend south to Tali. From here the boundary extends in a southeasterly direction through Shihping (near Linan) to the edge of the province, where the political boundary corresponds to a physiographic and geographic break.

AN ANTHROPOLOGICAL MUSEUM

The Southwestern Tableland is the most diverse region in all China in its human make-up. Only about half the population consists of real Chinese and the remainder is made up of a great variety of primitive peoples. The Chinese themselves are all immigrants from other provinces and are chiefly found in the plains and in the more accessible valleys from which they have driven the original inhabitants. Perhaps few parts of the world contain such a complicated racial mixture or offer such a fertile field for the study of anthropology as this region and the adjoining mountains.

The "barbarians," as they are often termed by the Chinese, include more than two hundred tribes or divisions. The chief races are the Miao, Lolo, and Chungchia, with Tibetan and Burmese stocks in the extreme west. Each group has its own language or dialect and leads a semi-independent political existence. These people are simple and ignorant but cheerful and kindly. Most of them live in the mountains where they eke out a simple living as herdsmen, hunters, and primitive farmers. The people are strong and energetic and the women have never bound their feet.

These tribes have a common quality in their hatred for the Chinese. Many districts have never been conquered and form virtually independent states, so indicated on many maps. Chinese authority extends only as far into the mountains as military control is effective, and there has been frequent guerrilla warfare.

Aborigines are found throughout Yunnan and in southern and western Kweichow. H. R. Davies, who has traveled widely throughout the region, estimates that in the plains of Yunnan where the density averages 1,000 per square mile, the aborigines make up from one-tenth to one-fifth of the population, while in the mountains where the density is but 10 per cent of this figure they comprise two-thirds of the in-



FIG. 183.—These Miao women from Kweichow are representative of the many primitive races crowded into this corner of Asia. (*China International Famine Relief Commission.*)

habitants.¹ These tribes were once scattered throughout all of southern and western China and represent the original occupants of this part of Asia. They have been pushed into these mountains by the expanding Chinese, who have in turn been pressed southward by the nomads of the northern deserts. In addition to the aborigines there are large numbers of Mohammedans.

Despite the splendid climate of the region, the inhabitants, both Chinese and non-Chinese, are apathetic and backward. The poverty of the people is in striking contrast to the resources of nature and the picturesque scenery. On account of the dullness of the Yunnanese, most business is in the hands of merchants from Canton and Szechwan.

¹ DAVIES, H. R. "Yunnan, the Link between India and the Yangtze."

The history of these provinces has been full of political unrest and rebellion. Although the distance from the court at Peking was such that it might have been covered in three days by train, the trip of 2,000 miles by sedan chair and cart required four months. Under such conditions supervision was impossible and unscrupulous Mandarins who had the misfortune to draw such a distant assignment usually saw to it that they made their profit in short order, with slight regard for the welfare of the helpless populace. While isolation has thus played a significant part, it is interesting to note that no section outside North China speaks as good Peking Mandarin as Yunnan.

The total population is estimated as 24,641,065, an average of 157 per square mile (61 per square kilometer) for each of the 156,800 sq. miles.

TABLE XXXIV.—CITIES OF THE SOUTHWESTERN TABLELAND

City and province	"Christian Occupation of China" (1922)	Douglas Jenkins, U.S. Vice Consul (1932)	Other estimates with source
Yunnanfu (Kunming), Yunnan.....	100,000	143,690	180,000 (Local estimate)
Kweiyang, Kweichow.....	80,000	.....	100,000 (Arnold, 1926)
Tsuni, Kweichow.....	70,000	.....	40,000 (Arnold, 1926)
Mengtsz, Yunnan.....	.....	44,799	193,004 (Customs, 1931)
Tali, Yunnan.....	26,700	43,807	6,000 (Richard, 1908)

A TEMPERATE CLIMATE

The temperatures of the region are related to its altitude rather than its latitude. Although the Southwestern Tableland lies next to the tropics, the climate is distinctly temperate, and conditions have little in common with those elsewhere in South China.

The winters are clear and pleasant with light frosts at night. Snow is occasionally seen on the plains but melts in a day or two. The average minimum temperature at Yunnanfu, which has an altitude of 6,200 ft. is 4°C. (39°F.); elsewhere it is higher or lower according to the elevation. The day and night averages for the entire region in January is about 10°C. (50°F.), decreasing from south to north. Yunnan is "south of the clouds" and has very little of the mist or rain which characterizes the winters of Szechwan. The dry season begins early in November and continues until the latter part of April. During this season the sun shines most of the time and the climate is delightful.

The summer is the monsoon season with rains at frequent intervals from June until September. The rain at times is torrential, and the rivers are subject to a rapid rise which floods the low-lying alluvial

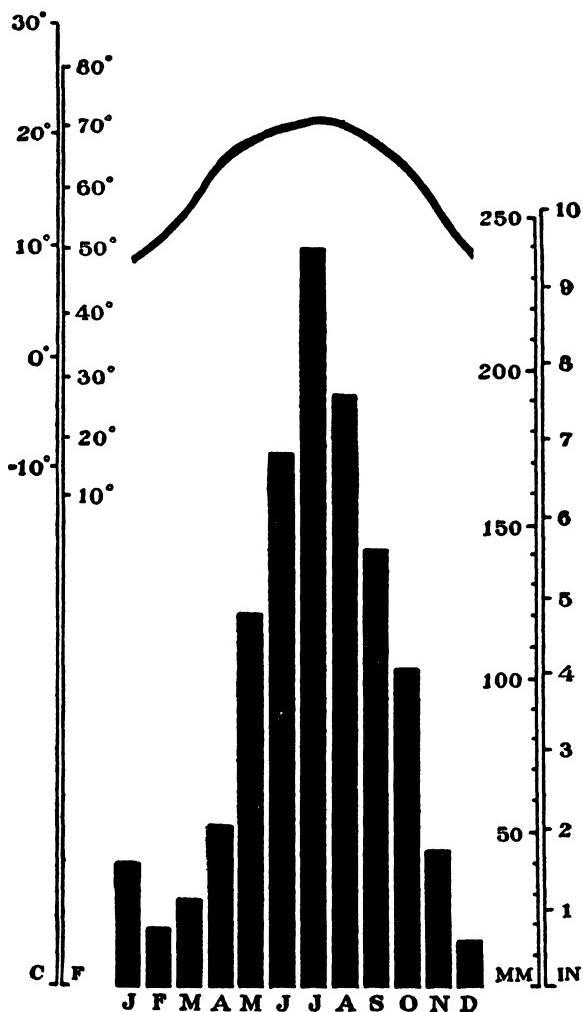


FIG. 184.—Climatic conditions in the Southwestern Tableland. Rainfall based upon Kweiyang (1,169 mm.), Mengtsz (925 mm.), Yunnanfu (1,040 mm.), and Tengyueh (1,479 mm.). Temperatures for Yunnanfu and Tengyueh only.

plains of the valley bottoms. Despite the high humidity, the climate is not oppressive, for temperatures remain moderate. The average summer maximum at Yunnanfu is 26°C. (79°F.), and the July mean for the entire region, including both day and night, is 25°C. (77°F.),

decreasing from east to west. There is no unpleasant heat and the plateau of Yunnan forms a summer resort for the Europeans from the steaming plains of Indo-China.

The annual rainfall is approximately 1,100 m. (45 in.).

The climatic conditions just described refer primarily to the plains of Yunnan and Kweichow. On account of the great contrasts of elevation between the deeper valleys and higher mountains, one may find at the same time both tropical and arctic conditions in near-by localities. Certain valleys have a dense growth of tropical plants and are hotbeds of fevers. Many of the mountains, on the other hand, are snow-capped until midsummer.

AGRICULTURAL CONDITIONS

Cultivation is confined to the upland plains, the few open valleys and to occasional terraced hillsides. Most of these are of limited area, but there are several plains in Yunnan which are tens of miles in extent. Wherever level land is present, cultivation is quite as intensive as anywhere else in China. In fact, the available figures indicate an even greater utilization of the agricultural land than in any other region. Hillside cultivation is dependent upon conditions of soil, slope, and water. In some districts terraces are carried up to the tops of the hills, but the rivers are usually in such deep canyons that irrigation of hill slopes is difficult. A considerable part of the cultivated area is in western Kwangsi and eastern Kweichow where the elevations are lower and the topography is more open. Farms are small in size and methods of cultivation exceedingly simple.

Rice is the chief summer crop and forms the staple food of all who can afford it. It is beyond the purchasing power of the poorer mountain people who depend upon corn, barley, or millet, raised during the same season as rice but on dry fields. Only one crop of rice is secured, and the harvest is in October.

Winter crops are common and include opium poppy, wheat, and oil seeds. The cultivation of opium has long been important in this part of China, and it was estimated in 1923 in Yunnan that poppy occupied two-thirds of the cultivated land during the winter season. The percentage in Kweichow is approximately the same. In the capital city of Yunnanfu, it is said that 90 per cent of the men and 60 per cent of the women are addicted to the habit of opium smoking. Many hsien produce from one to two million ounces and the removal of so much first-class agricultural land from useful production has induced a serious food shortage.

Other products of the region are tobacco, tea, hemp, and a variety of excellent vegetables, including large quantities of Irish potatoes. Excellent fruit is grown, including peaches, pears, apricots, persimmons, oranges, and lemons. There are also large crops of walnuts and chestnuts.

This region has more animals than any other in the South. Cattle, sheep, goats, pigs, ducks, and chickens are found in considerable numbers. There are no horses, but ponies and mules are employed for transportation, especially in the west. Plowing is done by yellow cows or water buffalo. Sheep and goats are found principally in the mountains but every farm has pigs and chickens.

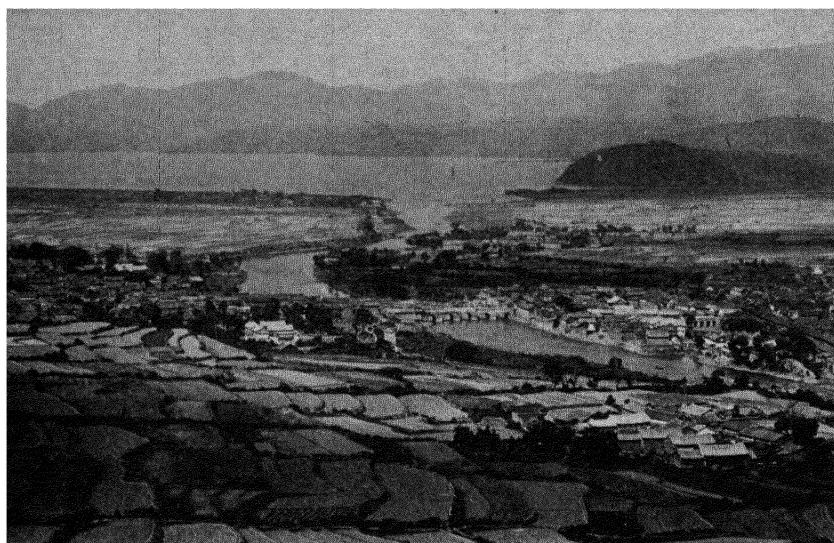


FIG. 185.—The important trade center of Siakwan in western Yunnan lies at the southern end of the Erh Hai, at an elevation of 6,500 ft. (*Ato Photographic Association.*)

The statistics of the former Ministry of Agriculture and Commerce at Peiping appear to be progressively less reliable with increasing distance from the capital. These estimates were compiled on the basis of questionnaires sent out to the hsien magistrate, many of whom had no interest in the survey nor any accurate information with regard to conditions in their district. The figures for Yunnan and Kweichow are incomplete and contain several obvious errors. As is the case in all regions, figures which are evidently incorrect are excluded and an average substituted in their place. Missing hsien are also given an average value.

No detailed figures are available for the cultivated land by hsien in Yunnan. About three-fifths of the area of the province is within the Southwestern Tableland but the cultivated land is probably more nearly four-fifths of the total. The area reported for Yunnan amounts to 11,496,856 mow, of which it may be assumed that 9,200,000 are in this region. On this basis the total area of cultivated land in the Southwestern Tableland amounts to 22,581,436 mow.

The cultivated land of the Southwestern Tableland thus amounts to only 4 per cent of the total area, with an average of 0.9 mow per person and a density of 4,189 people per square mile of cultivated land.

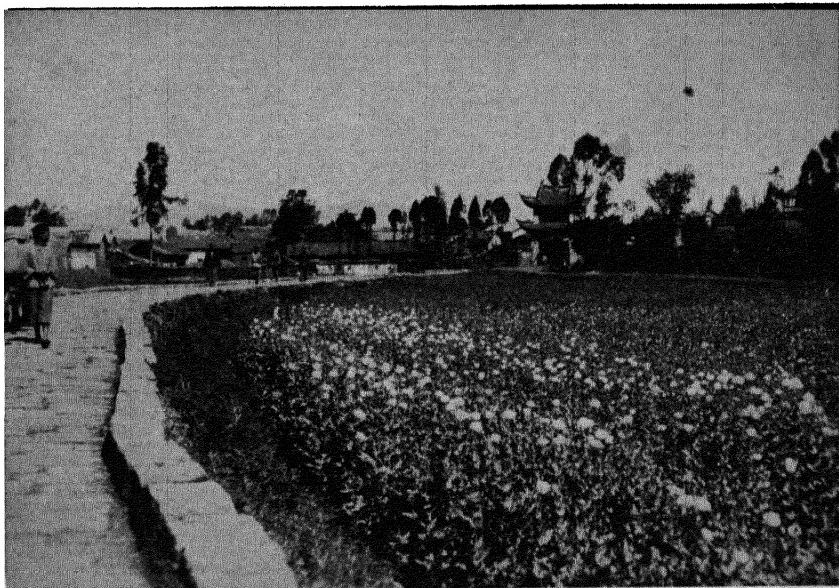


FIG. 186.—Fields of opium poppy outside the walls of Yunnanfu. (*U. S. Bureau of Foreign and Domestic Commerce.*)

The 1932 estimates of the Nanking Directorate of Statistics credit Yunnan with 27,125,000 mow and Kweichow with 23,000,000 mow. If these figures are accepted, the agricultural congestion is materially reduced, with something like 7 per cent under cultivation and 2,200 people per square mile of crop land. Whichever of these figures may be more nearly correct, they indicate that this region has a greater crowding of the arable land than almost anywhere else in China. This can only mean a low standard of living.

OVERLAND TRAVEL

The Southwestern Tableland is cut off on all sides from easy access to the outside world. Snow-covered peaks, tropical jungles, vertical-walled canyons, and inhospitable tribes unite to hold back contact with the outside world. Difficult communications and isolated communities characterize many sections of China, but in other regions there is usually some compensating factor, such as greater productivity, as in the Red Basin, or important through highways, as in the Loess Highlands. No such factor is conspicuous in the Southwestern Tableland. Except along the narrow-gage railway leading out from Yunnan to French Indo-China, there is very little commerce with the outside world. Through traffic to Burma on the west is almost nonexistent.



FIG. 187.—Many of the precipitous canyons of Kweichow are crossed by suspension bridges. The proportions may be judged by noting the people on the bridge. (*China International Famine Relief Commission.*)

The typical highways are narrow trails, paved with cobble stones or slabs of rock. Such roads have the merit of keeping the traveler out of the mud, but their polished surfaces become slippery in wet weather and constant walking on the stones is most tiring. The bulk of the commerce is carried on the backs of coolies, although mules and donkeys are also widely used.

The difficulties of travel across the Southwestern Tableland are strikingly illustrated by the experiences of a missionary family¹

¹ GOWMAN, CARL G., Shanghai: *North China Herald* (May 15, 1926), 305.

which transferred from Yungning in Szechwan, 40 miles from the northeastern border of Yunnan, to near Longling in southwestern Yunnan, about the same distance from the border of Burma. The overland journey was about 560 miles "as the crow flies," requiring fifty-three stages. Owing to the expense of coolie transport and the dangers of brigands, it was found to be 15 days quicker, 200 to 400 yuan cheaper, and far safer, to travel 6,000 miles "around the continent" via Shanghai, Singapore, and Rangoon, coming in through the back door of China.

The chief trails in Yunnan radiate from the provincial capital. From Yunnanfu there is a road north to Suifu on the Yangtze by way of Tungchwan and Chaotung which requires from thirty-two to thirty-six days. The principal west road from Yunnanfu is through Tali and Tengyueh to Bhamo in Burma, with twenty-four to twenty-eight stages. This road passes over very difficult mountains and through some of the most stupendous river canyons on the face of the earth. A railroad from Burma has been proposed but would involve the building of an almost continuous succession of bridges and tunnels. From Tali a branch trail leads north by way of Likiang to Batang, which is on the road from Szechwan to Lhasa.

Two lines of travel lead south and east from Yunnanfu. One is the route of the railway through Mengtsz to French Indo-China, with a caravan trail which branches off to Szemao in the southwest. The other road is the big east highway to Kwangtung. This road goes overland to Poseh at the head of navigation on the Si Kiang in western Kiangsi, 355 miles distant, and requires twenty days of travel. From Poseh boats go down stream to Canton.

Kweichow is less well supplied with trails than Yunnan, but an important line of communication leads from the capital at Kweiyang to Chungking on the Yangtze, fifteen days distant. The province is crossed from east to west by the old imperial highway from Peiping which runs from Hunan past Kweiyang to Yunnanfu.

Except for a short stretch of the Si Kiang in western Kwangsi, there are no navigable streams within the region. Several important rivers take their rise in this area but their courses through the valleys of the Tableland are wholly impracticable for boats.

The chief outlet from the Southwestern Tableland to the outside world is by way of the Yunnan Railway to Hanoi and Haiphong in French Indo-China. The line has a length of 289 miles within China and represents a remarkable feat of engineering. In this distance there are no less than 152 tunnels and 3,422 bridges, and the railway climbs from near sea level to a height of 8,000 ft. As it climbs to the

plateau, the railroad winds along the face of cliffs, plunges into tunnel after tunnel, often emerging for only an instant to jump across bridges which span deep chasms. The million and a half passengers carried each year are an indication of how railways are breaking down the natural isolation of remote sections.

The most recent development in transportation is the building of automobile roads, especially in Kweichow. The chief road is from the head of navigation on the Chi Shui near the Yangtze to Kweiyang

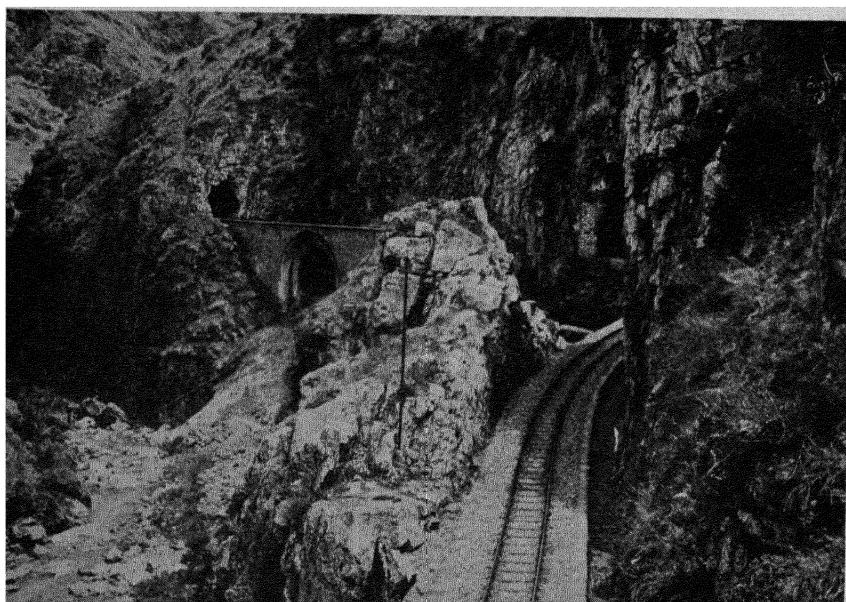


FIG. 188.—Bridges and tunnels follow one another in rapid succession on this railway which climbs from the torrid plains of Indo-China to the temperate plateau of Yunnan. (*Ato Photographic Association.*)

and westward toward Yunnan. Only a short length of motor roads has been built in Yunnan. Such roads will be of great benefit, although the cost of operating automobiles on imported gasoline is so high that it is far above the economic level of most people. The present cost of transporting goods on men's backs works out at about a yuan per ton per mile. Commerce is all but impossible where the cost of transporting rice two days' journey equals the value of the rice itself. Graphic stories are told of the first automobiles brought into these districts, for it was necessary completely to dismantle the machines and bring them in piece by piece on men's backs over ancient trails to the capital at Kweiyang.

NATURAL RESOURCES

Relatively little is known of the economic geology of southwestern China. Preliminary surveys and old Chinese records both indicate that this is a region of considerable metallic wealth. Coal and iron ore are mined in a number of localities but are of poor quality and apparently are limited in amount.

The chief resource consists of nonferrous minerals. Copper is said to have been produced in Yunnan for a thousand years, and the prov-



FIG. 189.—A memorial tower in the center of Tali. (*American Museum of Natural History.*)

ince has supplied most of the metal for coinage for all China. In addition to countless millions of *cash*, copper vessels of all sorts have been made in great numbers and shipped as far north as Peiping. The chief producing districts at present are in northeastern Yunnan and northwestern Kweichow. The production is rapidly declining and is said to be but one-twentieth of that at the time of the Emperor Chien Lung about one hundred fifty years ago.

The most valuable metal exported from any part of China, next to iron, is tin. The chief producing area is in this region near the city of Mengtsz in southern Yunnan. The deposits are worked entirely by native methods and the metal is shipped abroad through Hongkong.

The production amounts to about 6 per cent of the world's total. China is also an important producer of mercury, the chief mines being in Kweichow.

Other resources which are known to be present in some quantity include silver, zinc, lead, salt, placer gold, antimony, and precious stones. The region about Tali is famous for its beautiful marble, quantities of which are shipped all over China for making decorative panels on furniture.

Mining is carried on by primitive methods without geological advice or engineering assistance. Accidents are frequent and mines often have to be abandoned owing to the inflow of water. Expensive transportation greatly increases the sale price at the market, and the absence of highways makes it difficult to bring in modern machinery.

The Southwestern Tableland contains some of the richest timber areas of China. Despite rapid cutting within recent times, large reserves still exist, especially in Kweichow. Systematic planting of pine trees is carried on in some districts. If ruthless devastation continues at the present rate, there may be but little timber left when China wakes up to the seriousness of her forest problem.

NOTE. Additional views of the Southwestern Tableland will be found in Figs. 19 and 58.

CHAPTER XXI

THE TIBETAN BORDERLAND

THE PHYSICAL ENVIRONMENT

Around the eastern margins of the lofty Tibetan plateau are a series of sheer snow-clad mountains and tremendous gorges, which have steadfastly resisted Chinese penetration. Unlike the deserts of Mongolia and Sinkiang where elements of Chinese culture, if not

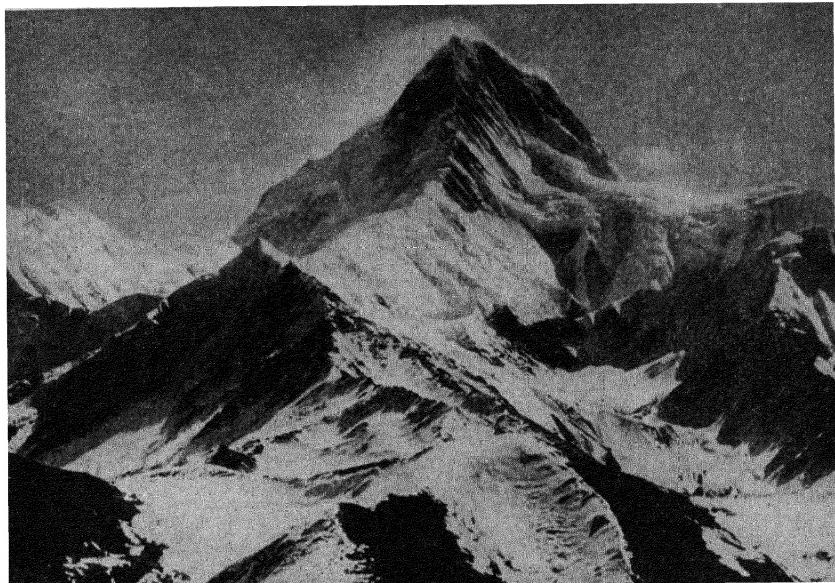


FIG. 190.—Minya Ginkar, monarch of eastern Tibet and the highest mountain in all China, viewed from the west. (*Arnold Heim.*)

always of political authority, have long been established, Tibet has had but limited contacts with China. The Tibetan Borderland embraces these marginal districts next to historic China where all human activities are strictly adjusted to the demands of a rigorous mountain environment.

Comparatively little is known concerning the very complex geologic structure along the border of the plateau adjoining old China.

There is a general north-south trend which appears to merge with the Himalayan and Kun Lun axes at either end. No definite name has been given these ranges but they are sometimes indicated on foreign maps as the Yunling or Szechwan Alps. In Chinese they are simply known as the Tahsueh Shan, or "Great Snow Mountains." Numerous peaks exceed 20,000 ft. and are glacier clad. As an expression of the decreasing moisture, the snow line rises as one goes northward, changing from 13,500 ft. in Yunnan to 18,000 ft. in Kansu.

The highest of these peaks is Minya Gonkar, southwest of Tat-sienlu. This great granite batholith culminates in a pyramid not unlike the Matterhorn. It was first climbed by a party of Harvard students in 1932 who measured its height as 24,000 ft. The surveys of Heim and Imhof, however, place the height at 7,700 meters (25,250 ft.).

The greatest relief is in the south where the Yangtze, Mekong, and Salween have carved some of the deepest and most inaccessible canyons in the world, parts of which have a depth of over two miles. Not far away are the valleys of the Hwang Ho and Brahmaputra, squeezed together into this canyon complex as though held by a clenched fist. Here in the Tibetan Borderland these five rivers are within a 400 mile zone; where they enter the sea, the outermost are 2,000 miles apart in an air line, or over 6,000 miles measured around the coast.

The northern portion of the Tibetan Borderlands is lower in elevation and less rugged and might almost be considered an elevated portion of Mongolia. This is the region of Koko Nor, so named from the famous lake which lies amid snow-capped mountains at an elevation of 10,500 ft. This salt lake is known in Chinese as Ching Hai, while its Tibetan name is Tsong-nong-pu; in all three languages the name means "blue lake."

The precipitation in the Tibetan Borderlands decreases from south to north, owing to the increasing distance from the ocean. Even in the north some places with a favorable topographic exposure have abundant rainfall, but the average is not over 300 mm. (12 in.). Toward the south the amount increases but probably seldom exceeds 800 mm. (32 in.). These figures are approximate, for there are only scattered records, usually from places in narrow valleys or other unrepresentative locations. It is certain that the Tibetan Borderlands have nothing like the heavy rainfall of the Himalaya, and some sections are to be classed as semiarid. It was at one time supposed that the floods of the Yangtze were due to the melting of the Tibetan snows. This has been shown incorrect, for there is comparatively little snow

to melt. The Yangtze receives its spring floods from rains in the Red Basin.

The temperatures are low, as befitting the high altitude. Fortunately the sky is clear during much of the winter, so that the cold is endurable. At these altitudes the sun is so bright that the traveler may have his face sunburned while his feet are frost-bitten. There is almost no real summer and people wear clothing made of felt or furs throughout the year.

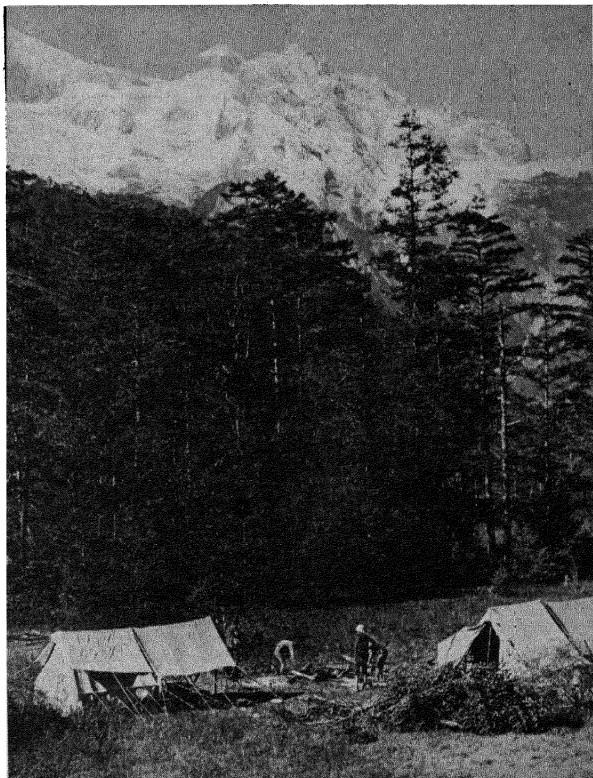


FIG. 191.—Snow mountains and splendid forests betray the heavier precipitation of western Yunnan. (*American Museum of Natural History.*)

In most sections the geographic limits are not sharply drawn. The most clearly defined boundary is in the north next to the Central Asiatic Steppes and Deserts, where the Nan Shan rise abruptly from the plain, and in Szechwan, where the Azure Range marks the limit of the Red Basin. The western boundary is vague and may only be defined as the approximate limit of the deep river canyons and the beginning of more rolling country on the plateau.

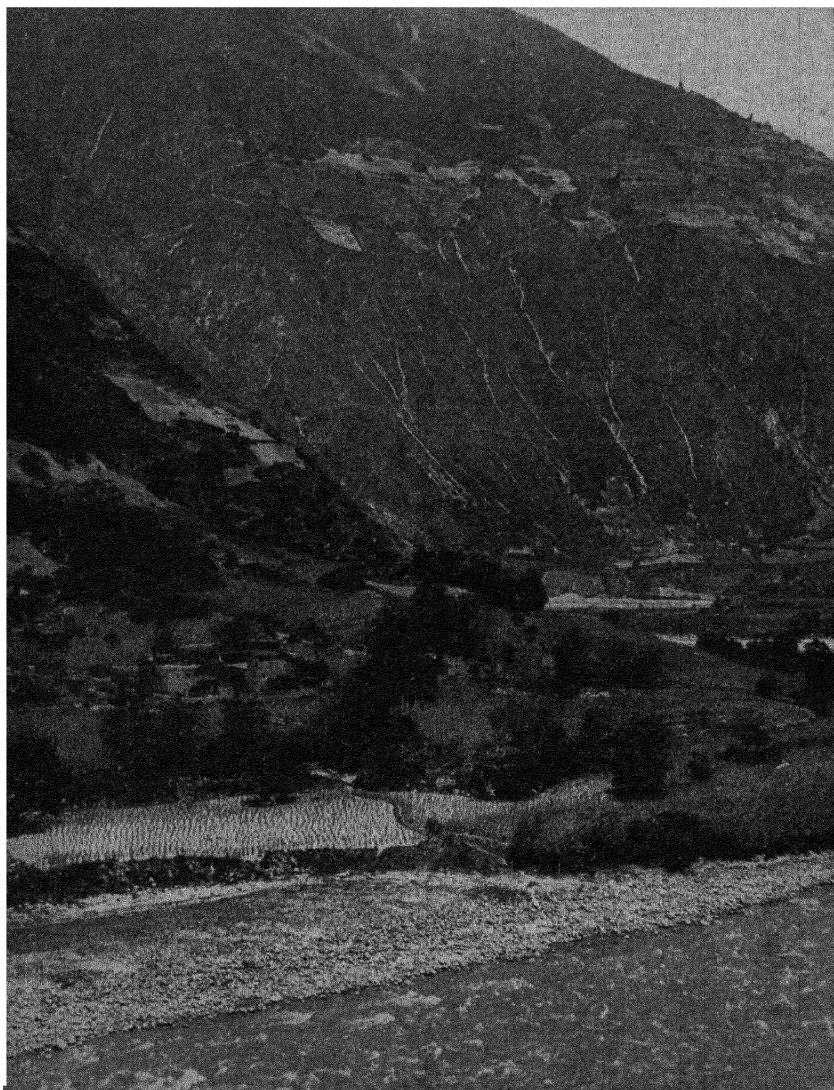


FIG. 192.—The steep slopes of the Min Valley in Chwanpien offer but limited opportunity for cultivation. (*Robert F. Fitch.*)

The Tibetan Borderland mainly lies within the new provinces of Chinghai (Tsinghai), or Koko Nor, and Sikang, or Chwanpien. It also comprises portions of southwestern Kansu, western Szechwan, and northwestern Yunnan. In the north it includes the eastern ranges of the Nan Shan, with an irregular border next to the Loess Highlands, where several valleys extend up into the higher ranges. The snow-clad Min Shan, west of the Tsingling, are Tibetan in their characteristics and are separated from the Central Mountain Belt to go with this region. The same condition is true of western Yunnan.

The area cannot be stated accurately but amounts roughly to 290,000 sq. miles (750,000 sq. km.).

TABLE XXXV.—CITIES OF THE TIBETAN BORDERLAND

City and province	“Christian Occupation of China” (1922)	Other estimates
Tengyueh (Tengcheng), Yunnan.....	44,000	19,000 (Customs, 1931) 82,951 (Jenkins, 1932)
Tatsienlu (Kangting), Sikang.....	40,000	10,000
Litang (Lihwa) Sikang.....	.....	6,000
Batang (Paan), Sikang.....	.....	1,200
Sining, Chinghai.....		
Tangar (Donkyr, Hwangyuan), Chinghai....		

ROADS TO THE PLATEAU

The Tibetan Borderlands form the gateway from old China to central Tibet. The principal trade routes are those connecting Lhasa with Kansu and Szechwan and are the routes of the tribute-bearing embassies of the past two centuries.

One of these routes leads from Tangar west of Sining in the newly created province of Chinghai and crosses the plateau southwest to Lhasa. Great caravans start out from Lhasa in the fall and require about two months for the trip to Tangar, where they stay over the Chinese New Year holidays in February, and return to Tibet in the spring. On account of the dangers from hostile tribes along the way, many of whom have banditry as their chief profession, people join in caravans which may number hundreds of travelers and thousands of animals. The chief transport animal of Tibet is the yak, a powerful shaggy-haired variety of ox which is particularly suited to the bitter cold and dampness of these highlands. These animals travel only some 20 miles a day but are sure-footed and carry heavy loads. This

route was the principal means of communication with Lhasa from the court of Peking and is still a great trade route.

The other route to Lhasa is from Tatsienlu, the Chinese transliteration for the Tibetan name of the town of Tarchendo in Sikang. Two routes lead westward from Tatsienlu. One goes directly to Batang by way of Litang, while the other and older route is to the north through Kantse and Derge. Large quantities of tea are shipped from Tatsienlu, but trade has declined within recent years on account of the disturbed political conditions. This route is much more difficult



FIG. 193.—Bales of brick tea for Tibet. Fierce dogs, leather bags for parched barley meal, bamboo water bottles, and matchlock guns are indispensable parts of every caravan. (*Ato Photographic Association.*)

than that from Tangar, for it is "through the land of deep corrosions" and crosses several high passes. Neither route is for the casual visitor. Travel in these desolate regions with their rigorous climate and great altitudes requires an exceptional physique and an ability to adjust one's mode of life to the requirements of the exacting environment.

Although China and India are neighbors, the impassable mountains along their borders have almost completely isolated them. Whatever contact China has had with India has been by means of the very roundabout and difficult road through Sinkiang and over the Pamirs, rather than through these mighty mountains.

THE POLITICAL BACKGROUND

The early history of Tibet is vague. The name Tubat appears in Chinese as early as the fifth century but apparently applied only to the central portion of the plateau. The usual Chinese name today is Hsitsang (western Tsang), but these words appear to be without precise meaning as to location.

In a geographical sense, Tibet loosely refers to most of the high plateau of south central Asia, but as such it includes areas never



FIG. 194.—Remarkable cantilever and suspension bridges span many torrential streams along the margins of Tibet.

claimed by China. Until recently, Szechwan and Kansu have nominally included large portions of the plateau borders which are entirely inhabited by non-Chinese tribes and have always been recognized as parts of real Tibet. In like manner, the map limits of Sinkiang extend far south of the Tarim Basin. Just where the boundaries of political Tibet lie today is a difficult question. Many of the tribes which inhabit the eastern mountains are warlike and completely independent of all outside influence. Regardless of wherever geographers or politicians draw lines on maps, they continue their separate life as before.

China's jurisdiction over Tibet dates from the early years of the Manchu dynasty, when the Chinese gradually assumed a tutelage

over the heads of Lamaism. Since the opening of the twentieth century, political events have been complicated. The two leading Tibetan rulers are the Dalai Lama and the Panshan Lama vaguely differentiated as the temporal and spiritual heads of the country. In addition to rivalries between them, there have been intrigues involving Russia and England, for whom Tibet forms a buffer state.

Tibet may be divided into two sections, Farther Tibet, containing Lhasa, and Nearer Tibet, which comprises the mountainous borderland next to the old limits of China proper. The latter lies between the westward projection of Kansu on the north and Yunnan and Burma in the south and is rather loosely known to the Tibetans as Amdo and Kham. In 1928 it was made into the provinces of Chinghai, or Koko Nor, and Sikang, or Chwanpien. Their eastern limits have been fixed by decree and roughly agree with the traditional edge of Tibet. On the west no precise boundary can be drawn, for the extent of actual Chinese control varies with the military strength of the border commanders. In general it does not extend west of the Yangtze in Sikang. Only the margins of the region give willing assent to Chinese jurisdiction. The Tibetan Borderland, as a geographic region, is limited to Nearer Tibet.

THE HUMAN RESPONSE

Much of Tibet is an inhospitable waste of frozen desert with few inhabitants. The scanty population is largely confined to the lower valleys in the south around Lhasa, and in the east next to China. Even these valleys lie at elevations of around 10,000 ft. and thus impose rigorous restrictions upon human activities.

This is one of the highest inhabited areas on Earth. On account of the rarity of the air, unusual strains are imposed upon the heart and lungs. Centuries of natural sifting have eliminated the unfit and those who remain are the product of a long and exacting selection.

The altitude is reflected in the lowered boiling point. In the city of Litang with an elevation of nearly 14,000 ft., water boils at 94°C. (201°F.). It is thus necessary for food to be cooked an unusually long time; but since fuel is limited, much of it is inadequately prepared.

The chief occupation is the keeping of yak and goats which find a scanty food in the alpine grasses. Since vegetation is sparse and scattered, it is necessary for the shepherds to move about with their flocks from one valley slope to another. Their life thus resembles that of desert nomads, with the exception that where the Mongols move horizontally, the Tibetan nomads move up and down the slopes with the seasons. This vertical nomadism is known as transhumance.

Owing to the limited area of grazing grounds, there are definite boundaries for each tribe and family group. These simple people have learned that, since the food-producing capacity of their land is fixed, it is unwise to increase the population. The system of Lamaism, here as in Mongolia, requires that one son from each family shall enter a monastery. This, and the practice of polyandry where several men

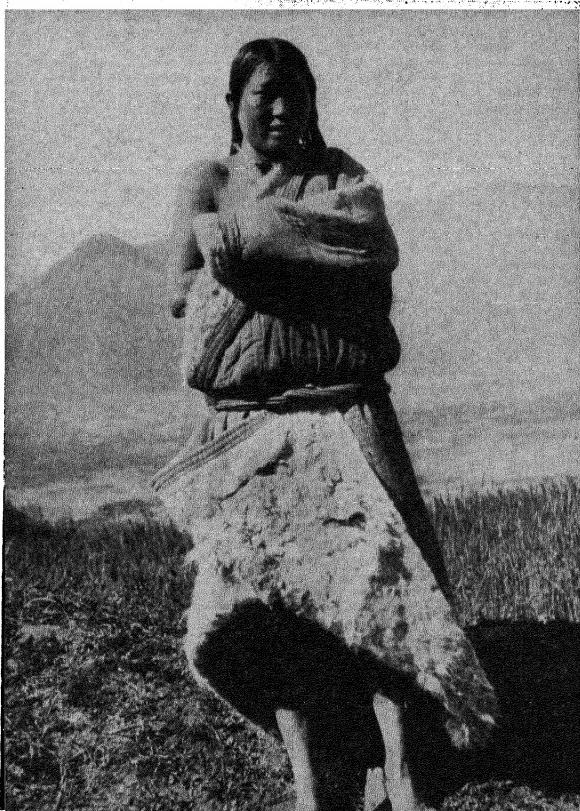


FIG. 195.—Although this photograph was taken in July, the felt garments suggest that there is no real summer on the plateau near Koko Nor. The same garments are worn the year around, but it is customary to slip one arm out of the sleeve on warm days.

share the same wife, form a kind of arbitrary birth control to keep the population within limits.

These nomads obtain their food, clothing, and shelter from their animals, so that grass is the basic resource of the Borderlands. The tents are made of a coarse black cloth woven from yak hair, which soon becomes impregnated with the grease and dirt about a Tibetan

dwelling. As a result, these cloth tents shed rain excellently. The bitter cold of the winter requires adequate protection, and the clothes are made of skins and felt. There is usually a large cloak or outer garment which is gathered about the waist by a girdle. This cloak has sleeves much longer than one's arms, so that gloves are unnecessary. In place of pockets, any articles to be carried about, such as the wooden bowls for food, are placed in the folds of the garment above the girdle.

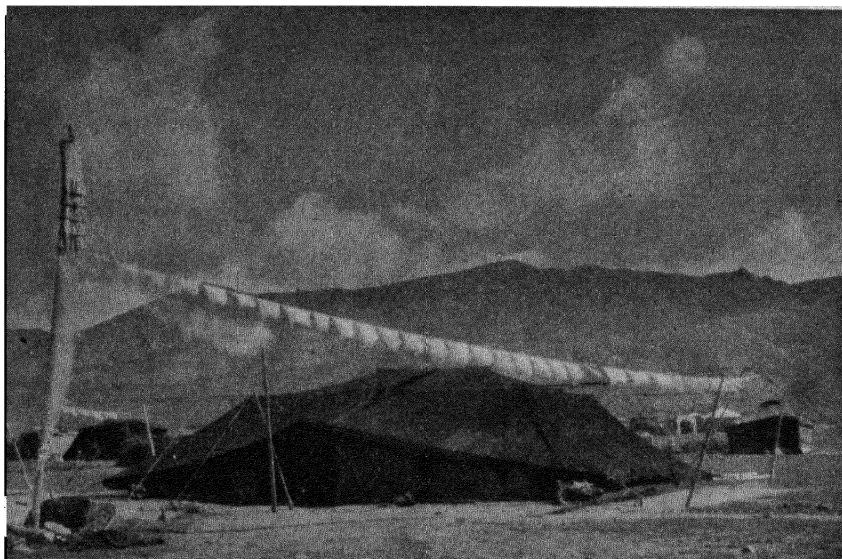


FIG. 196.—These black Tibetan tents near Koko Nor are made from the hair of the yak. The white cloths are prayer flags.

Most of this region is too high for ordinary agriculture, and the Tibetan is a poor farmer. Occasional flood plains or alluvial slopes are cultivated, but the growing season is short and the yield low. The chief cereal is barley, considerable amounts of which are also imported from the outside world. The barley is parched or roasted and then ground, so that it may be eaten without further cooking, and is known in Tibetan as *tsamba*. The principal food is the milk of the goats and yak, and the butter and cheese which are made from it. Here, as in Mongolia, milk tea forms an indispensable article of diet.

Where settled agriculture is possible, clusters of farmhouses have been built. These permanent dwellings are of stone and form the base of operations while some of the family are away in the pasture lands with the flocks.

Aside from a few Chinese cities in the eastern part of the region, the Lamaseries are the chief centers of settled activity. There are scores which have thousands of priests, while smaller ones are found in every important valley. These Lama temples are housed in massive buildings which are the Tibetans' chief attempt at architecture. Some are several stories high, and with their rectangular windows and massive appearance they resemble modern office buildings of the West.

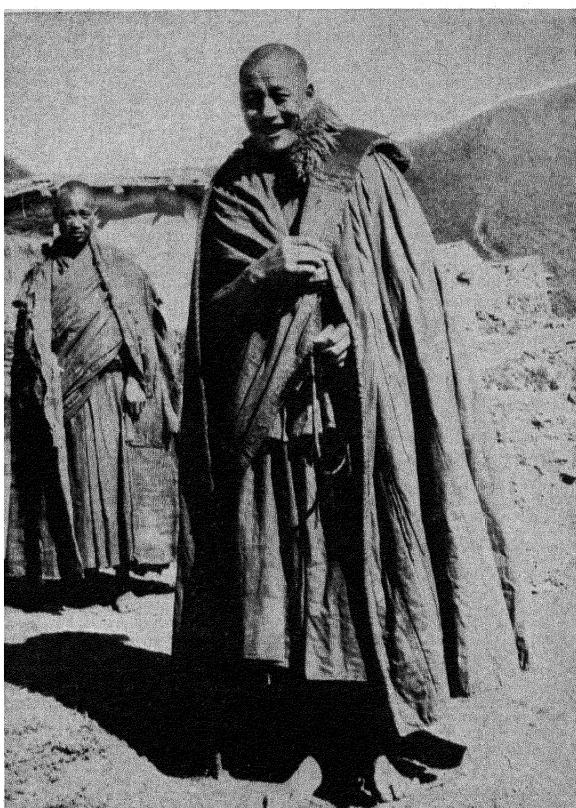


FIG. 197.—A Lama priest in his yellow robes.

The Lamaseries are the chief centers of wealth and trade. Many control large tracts of land, and at the various festivals they receive gifts from everyone. Trade and commerce, as well as religion and education, are their monopoly, and the heads of Lamaism are the temporal as well as the spiritual rulers of the land.

The Tibetan Borderland is difficult of access, and life goes on in each valley with almost no contact with the rest of China. Barriers of uncrossable torrents and snow-buried passes aid in building up race and language contrasts which make this a world by itself. The chief contact with China is along the caravan routes, on which, under peaceful conditions, there is a considerable trade. Thus Tatsienlu installed an electric-light plant in 1933. Outside influences do not extend far to one side or the other of the trail, and the life of the Tibetans is much the same today as it must have been centuries ago. Who can say when it will change?

TABLE XXXVI.—STATISTICAL SUMMARY

Chapter	Geographical region	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Chapter	
		Area		Population (Post Office, 1926)	Density of population		Area of cultivated land (including orchards)				Percentage of total area in cultivated land	Area of cul- tivated land per person, mow	Density of pop- ulation based on cul- tivated land only		Average rainfall, millimeters	Growing season, days	Crop percentages (estimated)						
		Square kilometers	Square miles		Per square kilometer	Per square mile	Mow	Acres	Square kilometers	Square miles			Per square kilometer	Per square mile			Rice	Wheat	Millet	Kao- li- ang	Beans		
VII	North China Plain.....	324,036	125,078	80,979,025	250	647	317,997,306	52,999,551	214,048	62,812	66	3.9	378	978	521	200	30	15	15	15	VII		
VIII	Loess Highlands.....	584,054	202,516	45,923,104	88	211	135,853,402	22,638,000	91,688	35,373	17	5.1	470	1,242	417	175	..	25	30	15	5	VIII	
IX	Mountains of Shantung, Lioutung, and Jehol.	235,151	90,761	25,961,242	110	286	70,048,199	11,673,887	47,879	18,178	20	2.6	549	1,427	645	200	..	25	15	15	15	IX	
X	Manchurian Plain.....	556,572	137,657	12,101,700	34	89	77,247,709	12,874,628	51,142	20,117	15	6.4	232	602	616	150	..	10	15	25	25	X	
XI	Mountains of Eastern Manchuria.....	259,224	100,060	4,692,805	18	47	22,068,644	3,778,001	15,301	5,903	5	4.9	307	795	700-1,000	125	..	15	20	15	25	XI	
XII	Khingan Mountains.....	456,291	168,408	2,061,927	5	12	No data	No data	No data	No data	No data	No data	No data	No data	300	100	..	5	30	30	5	XII	
XIII	Central Asiatic Steppes and Deserts.....	2,545,000	988,500	5,000,000*	2	5	No data	No data	No data	No data	No data	No data	No data	No data	No data	100-375	100	..	†	†	..	XIII	
XIV	Central Mountain Belt.....	332,218	125,236	37,383,237	112	290	74,183,921	12,363,987	46,074	19,810	15	1.9	759	1,930	800-1,000	250	15	25	10	5	XIV		
XV	Yangtze Plain.....	106,252	75,753	67,943,471	346	807	204,244,201	34,040,700	157,885	55,189	71	2.1	450	1,277	1,170	300	40	25	..	..	10	XV
XVI	Red Basin of Szechwan.....	195,382	75,418	45,860,118	224	581	115,000,000	19,166,666	77,025	20,948	39	2.0	664	1,408	974	325	80	15	†	†	10	XVI	
XVII	South Yangtze Hills.....	402,665	155,428	65,452,360	162	421	112,063,480	18,677,248	75,643	20,168	19	1.7	866	2,244	1,412	350	60	10	..	..	5	XVII
XVIII	Southeastern Coast.....	185,703	70,009	20,585,156	161	417	42,940,016	7,156,709	28,985	11,020	15	1.4	1,021	2,084	1,450-1,800	350	60	5	..	..	5	XVIII
XIX	Hills of Liangkwang.....	573,280	144,086	41,030,940	110	285	40,194,485	7,699,081	31,181	12,029	8	1.1	1,318	5,495	1,494	365	60	5	..	..	5	XIX
XX	Southwestern Tableland.....	406,817	156,800	24,641,065	61	157	32,551,436	5,763,573	15,242	5,881	4	0.9	1,618	4,189	1,045	325	40	15	..	..	10	XX
XXI	Tibetan Borderland.....	750,000	290,000	4,000,000*	5	14	No data	No data	No data	No data	No data	No data	No data	No data	300-800	125	†	†	†	..	XXI		
	Agricultural China (omitting the Khingan Mountains, Central Asiatic Steppes and Deserts, and Tibetan Borderland).....	3,789,330	1,469,682	477,474,140	126	526	1,241,579,568	206,833,001	856,674	322,943	22	2.6	557	1,479									
	Provincial China (twenty-eight provinces, omitting Outer Mongolia and Farther Tibet). Greater China (twenty-eight provinces plus Outer Mongolia and Farther Tibet).....	8,025,114	3,097,836	485,508,838†	60	156	1,260,000,000*	210,000,000*	870,000*	328,125*	11	2.6	558	1,480									
		11,078,105	4,277,260																				

Caution concerning the uncritical acceptance of statistics on China cannot too often be emphasized. Care has been taken to sift and edit these figures, but no finality is possible. The estimates for each region should be considered in relation to other regions rather than as absolute measurements.

Areas of the several regions (Columns A and B) have been derived from plazimeter readings.

The most recent population estimates by hsien are those of the Post Office for 1926 (C). In cases where the boundaries of a geographical region pass through a hsien, half the population is arbitrarily allocated to each region.

Statistics of cultivated land (F to I) are derived from the reports of the former Ministry of Agriculture and Commerce in Peking, usually for 1915, and have been edited for the more obvious errors.

The ratio between cultivated land and the total area of the different regions (J) is especially significant. These figures can be no more accurate than the statistics of the Ministry of Agriculture and Commerce and it is well to allow for errors with increasing distance from the capital. Such percentages furnish a suggestive guide to the extent and possibilities of land utilization.

The area of cultivated land per person (K) includes the city population as well as those who

obtain their living directly from the soil. The average area of cultivated land per farm person would be somewhat larger. Since the average Chinese family numbers six or a little less, the figures may be multiplied by six to give a comparative index for the typical farm. Striking contrasts are apparent between the North and the South; thus the average person in the North China Plain has three and a half times as much agricultural land for his support as the people of Liangkwang. The small per capita crop areas of South China are compensated for by the fact that two or three crops may be obtained each year, whereas but one or two are possible in the North.

Statistics as to the density of population in terms of cultivated land alone are given in Columns L and M. This information is derived from Columns A and B and F to I which are not entirely reliable. Despite this uncertainty and the likelihood of certain minor inaccuracies, these figures present some of the most suggestive material in the entire Statistical Summary. No discussion as to whether or not China is overpopulated can be complete without reference to figures such as these. Where as many as a thousand people have to obtain their livelihood from 1 sq. mile, it seems impossible that any type of agricultural exploitation can yield much more than enough for bare subsistence and a minimum of personal comfort.

The average rainfall (N) is obtained from the reports of Zikawei Observatory. In regions where there is considerable variation, the figures listed cover these extremes; elsewhere the amount is the average of stations selected for the climatic graphs in each regional chapter.

The length of the growing season (O) is the approximate number of days during which crops will grow. Statistical data are not available and these figures represent a first attempt. They are presented with considerable reserve and should be thought of only as comparisons between regions.

Columns P to T are devoted to a comparison of the crop area of five principal crops. In cases of double cropping, the total of summer and winter combined is considered as 100 per cent. Thus where the entire agricultural area is devoted to rice during one season and to various other crops during another, rice is credited with 50 per cent. These estimates are based upon scattered data and are approximations which may not be true for every locality within a region.

The area of Provincial China is that given in Table II on page 55. The figure for Greater China is from the "Encyclopedic Britannica."

*Inadequate data. figure estimated. †Small indefinite amount.

†Without parts of Inner Mongolia and Farther Tibet.

Facing p. 394.

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A PHYSIOGRAPHIC DIAGRAM OF THE TWENTY EIGHT PROVINCES OF CHINA

THE GEOGRAPHICAL REGIONS OF CHINA

NCP - North China Plain CMB - Central Mountain Belt
 LH - Loess Highlands YP - Yangtze Plain
 SLJ - Shantung, Lioutung, and Jehol RB - Red Basin
 MP - Manchurian Plain SYH - South Yangtze Hills
 MEM - Mountains of Eastern Manchuria SC - Southeastern Coast
 KM - Khingan Mountains HL - Hills of Liangkwang
 TB - Tibetan Borderland ST - Southwestern Tableland
 CASD - Central Asiatic Steppes and Deserts

